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# Using Brain Research to Aid Reading Comprehension

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# Using Brain Research to Aid Reading Comprehension

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"Does it matter to learning if we pay attention?...You bet it does" (Medina, 2007, p. 74). Studies John Medina, Richard Mayer, and numerous others prove the more attention the brain gives to a certain stimulus results in better retention of the information due to the fact that the information is more elaborately encoded. The more attention grabbing something is, the more emotion that is involved, means the better that information is remembered. As a future teacher, this detail has many implications for me. If I want students who are learning, then I need to design lessons that invite the students to participate emotionally since emotion is the driver of attention, which is the driver of learning (Sylwester, 2000, p.23)

With the development of modern brain scanning technologies such as the EEG and PET scan, the ability to see and research how the brain functions has opened up new areas for research. These technologies have proven to be a valuable resource to schools, as scientists are making discoveries about how different brains carry out certain tasks.

One of these tasks that is receiving a lot of research coverage is looking at how the brain learns to read. The information database on how the brain learns to read is slowly expanding and should have a valuable impact on the classroom. If teachers choose to realign their teaching methods with strategies that coincide with how the brain actually learns to read, imagine the vast amount of learning that could take place. This relatively new area of study could revolutionize schools as we know them.

A few interesting findings that these studies have already revealed are: novice readers use different cerebral pathways while reading than skilled readers; people with reading difficulties use different brain regions to decode written text than do typical readers; and with proper instructional intervention, the brain of young, struggling readers can actually be rewired to use cerebral areas that more closely resemble those used by typical readers (Sousa, 2005, p. 5). Neuroscience and cognitive psychology have worked together to make a large impact on the reading curriculum. Brain imaging studies have opened up a new field of study. Some schools, called brain compatible schools, are embracing these findings to set up learning environments that correspond to how the brain actually functions. Teachers need to embrace these findings and ask themselves, "What can I take from these studies and apply to my teaching so that student learning is increased?" Teachers of reading should take note and capitalize on the research that is available.

## *Reading Comprehension*

> Have you ever thought about what your brain goes through when you read? First, your eyes have to scan those squiggly lines and curves called the alphabet and group them into the words as indicated on the page. Then, certain areas of the brain work to associate the written symbols with the sounds of language already stored in your head. As this association occurs, other neural networks decode the writing into a mental message that you understand. Incredibly, your brain can process and comprehend an entire sentence in a few seconds (Sousa, 2005, p.1).

The brain undergoes this elaborate process each time a reader sits down to read. There is no specialized area in the brain for reading (Sousa, p. 32), instead the process of reading requires many neural networks to work together successfully in order for the words on the page to be both read and understood. This is an incredibly challenging task, no wonder so many students struggle with learning how to read. Teachers of reading need to provide students with specific reading strategies to help make the process of reading easier and more accessible.

Recently in schools, there has been a heavy push to emphasize reading instruction. Consequently, teachers are feeling the pressure of helping students read 'at grade level.' With this focus on reading, an important question to ask is, "What is reading?" This question can produce varying answers, but the bottom line is that reading is so much more than simply being able to recite the words on the page. Central to reading is comprehension. In Dorothy Strickland's (2002) book *Supporting Struggling Readers and Writers* she writes that reading comprehension is "the essence of reading" (p. 141). Because comprehension is so crucial to successful reading, teachers need to be equipped with the knowledge of how to teach comprehension and strategies for teaching this important skill.

One of the first stages of reading is decoding. This is the process whereby "a beginning reader deciphers printed words by linking them to the spoken words that the child already knows" (Sousa, 2005, p. 37). In order to successfully complete this process, the child must first realize that "a printed word represents the spoken word through a written sequence of letters (graphemes) that stand for phonemes, and then blend the phonemes to pronounce the word" (Sousa, p. 37). Children need

to grasp that the phonemes, which represent individual sounds, correspond to the graphemes, the written representation of the sound, which are written on the page. The child must then blend those units of sound, phonemes, into one word. A child who is learning to decode goes through this process laboriously one word at a time.

According to research done by Moats, Furry, and Brownell, "Research shows that a child must be able to decode with accuracy and fluency in order to read proficiently" (Sousa, 2005, p. 37). This implies that simply decoding the words does not result in proficient reading. While fluency is an important component of reading, fluency alone does not produce proficient reading. While simultaneously decoding, a child needs to be taught how to also comprehend the words that his or her brain is decoding. Text comprehension is a key component of reading. It occurs:

> When the brain's frontal lobe is able to derive meaning by processing the visual and auditory input that resulted from reading with the reader's prior knowledge. Teachers should emphasize text comprehension as early as the primary grades, rather than waiting until children have mastered reading basics" (Sousa, p. 98).

Thus, even though beginning readers are struggling with morphing individual graphemes into words, a focus on comprehension cannot be neglected. While children are learning the all-important skill of decoding, those children should simultaneously be learning comprehension strategies.

From this information, one can deduce that decoding is in fact a very critical skill that forms the basis for comprehension. It is important that once children have learned to decode a word, they are exposed to that word time and again for research

shows, "following repeated encounters with the same word, the child's brain forms a composite neural code for the word that includes its spelling, pronunciation, and meaning" (Sousa, 2005, p. 57) and, "as more word forms collect in this cerebral region, reading becomes more fluent and reading skills rise dramatically" (p. 56). As words are encoded into a neural code, the decoding process takes less time, retrieving the meaning of the word becomes a more efficient process, and more space in the brain is freed to focus on comprehension.

"Successful decoding includes phonemic awareness, phonics, and fluency. Comprehension requires a developed vocabulary, interaction with the text, and a teacher whose training provides strategies for advancing the learner's ability to understand what is read" (Sousa, 2005, p. 70). Decoding is a building block for fluency, which is a building block for comprehension. While these build upon each other they must also be developed simultaneously. One cannot have comprehension without decoding and visa versa. Because true reading necessitates understanding, providing readers with these building blocks becomes an essential task. Sousa (2005) explains:

> Children who are first learning to sound out words are using substantial mental effort, so fewer cerebral resources remain for the cognitive operations needed to comprehend the words being read aloud. It is critical for children to develop fluency in word recognition. When they are fluent, word recognition requires far less mental effort, freeing up the child's cognitive capacity for understanding what is read (p. 96).

The brain can only focus on so much at one time, so if decoding is taking up the majority of the mental effort, comprehension will consequently be lacking. Efficient decoding helps to produce a fluent reader.

> Sousa (2005) describes fluency as:
>
> the ability to read a text orally with speed, accuracy, and proper expression. Case studies report that fluency is one component that is often neglected in the classroom. Children who lack fluency read slowly and laboriously, often making it difficult for them to remember what has been read (recall the limited capacity of working memory) and to relate the ideas expressed in the text to their own experiences. Frequent practice in reading is one of the main contributors to developing fluency (p.82).

Because fluency is such a critical factor in comprehension, it cannot be overlooked in the classroom. Frequent practice in reading is one of the single most important tasks a teacher can use to aid a child's comprehension as "experience in reading improves several components of the decoding and comprehension processes" (Sousa, p. 60). As a child practices their reading, more words are added to their mental lexicon and "word form areas of the brain acquire increasingly accurate representations of a word's spelling, thereby strengthening the connection between how the word sounds...and its spelling" (Sousa, p. 60). The stronger the connection between the two, the faster, and more fluently, one is able to read.

Reading practice also serves to turn low-frequency words into high-frequency words which in turn aids in the fluency of reading. This helps to lesson the gap between word recognition and comprehension. The brain is a pattern

machine and continually seeks out patterns. As a child practices reading, he or she is exposed to more of the letter patterns that form the words they read. This supports the brain's ability to read fluently. Reading practice also increases "facility with words because it increases the quality of the words' representation in the lexicon, thereby enhancing comprehension" (Sousa, 2005, p. 61). As the brain's mental lexicon expands and is enhanced, a reader is able to recall more quickly the visual representation of the word that is being read. When they can pull the visual representation of the word from their mental lexicon, the reader achieves gains in fluency and comprehension.

Teachers will agree that the goal of reading instruction is to provide children with the support and strategies needed in order for the children to be able to interact deeply with the text. David A. Sousa (2005), a doctor of education, describes the goal of reading as this:

> The ultimate goal of reading is for children to become sufficiently fluent to understand what they read. This understanding includes literal comprehension as well as more sophisticated reflective understandings, such as 'Why am I reading this?' and 'What is the author's point?' Reading comprehension depends heavily on spoken language comprehension. As children master the skill of word identification, their reading comprehension improves dramatically. Reading comprehension is a complex cognitive process that relies on several components to be successful (p. 90).

The strategies mentioned below are strategies that link brain research findings with effective reading comprehension strategies. Every brain is wired differently and no

brain learns exactly like any other (Medina, 2008, p. 66). Consequently, although these strategies have all been supported by brain research, not every strategy will work with every student. However, when a combination of these strategies, combined with good teaching and rich text are used, readers will learn to be successful readers. Paterno has researched effective reading strategies for secondary education and describes this formula for developing critical readers. "Create a classroom climate that fosters inquiry by encouraging students to question, to make predictions, and to support their value judgments. Students employ higher-order thinking skills to evaluate evidence, draw conclusions, make inferences, and defend their line of thinking" (Sousa, 2005, p. 104). This type of high-level thinking takes reading instruction beyond decoding skills and right into the heart of brain research.

## *Comprehension Strategies and Techniques*

### Background Knowledge

Decoding is an essential step on the road to reading comprehension. However, just because a child can decode words, does not imply that the child has comprehended what was read. Following is a prime example of what many children experience when they sit down and read a passage. Read the passage below:

> But, with Marcus Trescothick at the helm after Michael Vaughan injured his knee last weekend, the tourists refused to let their heads drop. An impressive display from spinner Udal, at 36 England's oldest debutant in 17 years, and Flintoff brought them back into contention. Harmison swung the balance further in their favour with two wickets in the first over after tea. He had

> danger man Younis Khan lbw for 39 then set Hasan Raza up for a loose drive at a delivery that yorked him. Despite having two slow bowlers in their attack, Ashley Giles and Udal, England had waited until the 25th over of the day to introduce spin. Left-armer Giles' arrival directly preceded Flintoff's wicket. Udal had to wait until after lunch to bowl his first Test delivery, which Butt lofted over cover for four. (England, 2005).

I was able to fully decode each and every word in this passage. However, because the contents of the article were so foreign to me, my comprehension of the article was severely lacking. I did not have enough background knowledge of the topic at hand to even be able to answer the most basic questions pertaining to this article. My decoding skills were not lacking, but my comprehension was. My brain was trying to activate any schema I might have had relating to this topic but to no avail. Sousa (2005) reiterates that, "information that does not fit into these schema may not be understood or may be understood incorrectly" (p. 52). This article was from a British newspaper and it gave an account of a recent cricket match. My knowledge of the game of cricket is very limited and thus the information I read did not fit into my current schema. If I had known the article was about cricket prior to the reading, I would have gleaned more understanding from it. On a second reading, once I knew that the topic was cricket and I had accessed my background knowledge pertaining to that topic, I understood a bit more of the information presented. In order to comprehend this article the first time through, I would have needed more background knowledge of the topic at hand.

This example points to the importance of providing students with background knowledge so they can successfully activate their schema, which is the sum of their knowledge on a particular topic. Teachers need to teach students to activate background knowledge of the topic prior to reading.

Comprehension ties into brain research in many ways, but one key area where they overlap is relating to background knowledge. Our brains are wired to search for patterns, therefore, we are more likely to pay attention to something if we think we have seen it before or can relate to it in someway (Medina, 2008, p. 82). Hence, explicitly teaching students strategies that will help them connect their previous experiences and background knowledge of the subject to their own lives increases their attention and emotional investment in the text, which aides their comprehension, which increases their learning and retention. Thereby, due to the impact background knowledge can have on comprehension, finding effective ways of tapping into their students' background knowledge is key for teachers.

Teachers of reading use a variety of different methods to help their students tap into their background knowledge of a subject. One method is to use an AlphaChart to help students get their ideas flowing. This is a five by five grid with one letter of the alphabet placed in each box (the letters *x* and *y* are usually combined in the same box). Students are given several minutes to use the AlphaChart to write down everything they can think of pertaining to a particular topic. If the topic at hand is *World War II*, then in the *A* box students might write *allies* and *air raids.* In the box labeled with a *B* the students could write *bombs, Britain,* and *Boeing.* This is a method which enables students to get their thoughts

flowing without having to focus on if they are correct or not. Teachers can have students compare these lists with another student, in groups, or as a whole class. This can even be a tool that students can keep and add more words to throughout the unit of study.

Another method is for students to create a timeline. Again, if *World War II* is the topic, students could draw a picture of something that reminds them of WWII, or groups could be assigned a time span within the war and then create a pictorial representation of that time frame, or students could be assigned a specific topic from the war, such as planes, and depict how that evolved throughout the course of the war. This is also helpful for students who do not have much background knowledge on a topic. Providing this information prior to the reading of a text will enable them to more fully comprehend the literature that they are reading.

There are many other ways to construct a timeline, the importance being that the students are using background knowledge about a topic. Once a student has illustrated his or her assigned part he or she can then add it to large class timeline. Prior to placing it on the timeline, the student could even briefly explain to the class what the drawing represents. In this way, the other students' background knowledge is also being expanded. The pictorial aspect of this piece will benefit all students as the brain learns well when pictures are used to teach concepts. Keeping this timeline up and adding to it throughout the course of the year will help students to gain a better grasp of how different aspects of history are interrelated and how history builds upon itself. As students gain a deeper understanding of history, they will be able to use that background knowledge as they engage with different texts.

Having this up in the room will also allow the teacher to use it as a continual reference and source of background information as new ideas are taught.

Yukio Tsuchiya's (1988) picture book *Faithful Elephants* is a poignant tale which illustrates the heartache that zookeepers in Tokyo suffer as they must allow their beloved elephants to starve to death in order to protect the greater good. This war story is heartbreaking, but at the same time it opens one's eyes to the costly effects of war. In keeping with the theme of *WWII* from above, teachers could first have students use an AlphaChart to see what knowledge the students have about WWII. Then, students could compare their AlphaCharts with other charts in the group. Students could elect one member to go around to the other groups in the class and take a look at those AlphaCharts to see if those groups had come up with different ideas. In this way, the children were given ample time and ways to access background knowledge about war and what can happen as a result of war. The teacher could then introduce this book to the class and discuss with students what things on the AlphaChart did they also see illustrated throughout the book? The specific methods and books teachers use to access background knowledge are not important as long as teachers equip students with background knowledge and ways of accessing background knowledge. Greater access to background knowledge will result in greater comprehension.

Independent Reading

Independent reading is one, simple technique that teachers can have children practice reading on a daily basis. In fact, according to the study conducted by Cunningham and Stanovich in 1998 which was later reinforced by Hart and Risley's

research in 2003, "some researchers estimate that young readers who engage in independent reading for just 10 minutes a day read over 600,000 more words each year than students who do no independent reading" (Sousa, 2005, p. 84). And, the more words that are in a child's mental lexicon, the more fluently they are able to read, which means that they are able to comprehend at a more thorough level. The significance of practice on a child's reading ability cannot be overlooked. Because of the importance of reading practice, teachers must be challenged to find effective ways to have their students practice as well as develop effective ways to get their students engaged with the text.

Practice may not always make perfect but practice does lead to permanency. Because of this, "it is important that the activities associated with practice be carefully planned to ensure that the learning being stored is correct" (Sousa, 2005, p. 67). In order to help ensure effective practice leading to the correct storage of information, many teachers place a large emphasis on connecting the right books with the right children during independent reading time. If children spend the duration of this reading time attempting to read books that prove too challenging, books that do not interest them, or books that do not offer enough challenge, then the desired outcome of effective practice met with the joy of reading has not been achieved. Teachers need to teach children how to select appropriate books; these books are often referred to as 'just-right' books. In Sharon Taberski's (2000) *On Solid Ground: Strategies for Teaching Reading K-3*, she describes in depth the process she teaches her children for selecting the right books. It is important that these books are interesting to the child, offer the appropriate level of challenge, and are

quality literature. By being intentional in the book selection, Sharon is maximizing the time her children spend practicing reading for optimal learning.

Multisensory-SupraAdditive Integration

This technique involves incorporating more than one of the five senses into the teaching of reading. The power lies in having more than one of the five senses involved in the lesson. Teachers could have students listen to reading and have them touch the page as the words are being read. Alternatively, teachers could place a poster, containing both a word and a picture, in front of the child. Then, as the child reads and sees the word, the child could be touching the object. For example, if a child sees a picture of the word 'brush' with the word underneath the picture, the child would then pick up and physically touch the brush. This would be a great activity when the child is reading adjectives such as 'hard' and 'soft. ' It provides more context for the child as the word is stored in the mental lexicon of the child. Additionally, the child could be shown a word and then write the word in shaving cream, sand, or paint. The child could use raised rubbings to write the word or draw a picture to go along with the word. Incorporating touch and physical manipulatives makes the learning more permanent. There are a plethora of worthwhile activities in this realm that would be both engaging and meaningful because they involve multiple senses.

There is powerful brain research behind this technique. Richard Mayer, a cognitive psychologist, has conducted several experiments which have conclusively pointed to the effectiveness of using multisensory experiences to enhance learning. His experiments start like this: he divides the participants into three groups. "One

group gets information delivered via one sense (say, hearing), another the same information from another sense (say, sight), and the third group the same information delivered as a combination of the first two senses" (Medina, 2008, p. 208).

And the results? "The groups in the multisensory environments **always** [emphasis added] do better than the groups in the unisensory environments" (Medina, 2008, p.208). The third group has more accurate recall of the information but that is not all. "Their recall has better resolution and lasts longer, evident even 20 *years* later" (Medina, p. 208). The findings do not even end there, they get better! This multisensory learning experience increases problem-solving skills, which is an essential skill for a reader. Readers need problem solving skills as they come to a word they do not know or a passage they do not understand. Physical benefits occur as well as the eyes react to visual stimuli more quickly, which could in turn improve fluency as the eyes are trained to track print more quickly (Medina, p. 208). In fact, "when touch is combined with visual information, recognition learning leaps forward by almost 30 percent, compared with touch alone" (Medina, p. 208). This has huge implications for the teaching of reading and reading comprehension. If involving another sense in the learning process can have this significant of an impact on learning, why are reading teachers not taking advantage of this more frequently?

With this research, a question that comes to mind is, why does this work? All of the components of the exact reason why are not fully understood as of yet. However, the prevailing explanation involves the working memory. The working

memory allows a learner to hold information in this space for a short period of time. The transferring of information from the working memory to long-term memory affects whether "something that is taught will also be learned" (Medina, 2008, p. 209). How does this involve multisensory learning? "Extra information given at the moment of learning makes learning better" (Medina, p. 209). This is saying that the more senses that are involved when learning is presented, the more possible ways the learning can be encoded which in turn means there are more ways for that information to later be retrieved. This extra "cognitive processing of information...helps the learner integrate the new material with prior information" (Medina, p. 209). An important aspect of reading comprehension is making connections to the literature that is being read. And, in order to do that successfully, a reader must be able to integrate the current passage with prior information. This strategy could be carried out in so many simple, creative, or elaborate ways in the classroom and could greatly impact student reading comprehension.

The book *If You Give a Dog a Donut* by Laura Numeroff (2011) is a book that works well this strategy. This book speaks of several foods, i.e. donuts and apple juice, and teachers could incorporate smell, taste, and touch with those foods while reading this story to children. In addition, one can purchase of vocal reading of this book read by the author herself. This would be an additional way incorporate the sense of hearing instead of having children read the book to themselves. A teacher could use this book, along with many other books, to involve multiple senses to take advantage of greater learning that can come by doing this.

Gist/Overview First

When presenting a book, a passage, or a chapter to readers, especially struggling readers, a simple and yet effective strategy is to introduce the reading selection by first giving a brief overview. Providing readers with a gist of what they will soon be exploring gives the mind of the reader time to activate its schema on that topic and mentally prepare itself for the passage that will soon be read. This is not a new concept, pre-teaching is very common, and it can often be done in a very short amount of time. Many teachers employ this strategy by simply beginning with a statement such as, "In just a moment you will read a story about..." They talk about certain characters within the story, the setting, the topic, or provide some important background knowledge that will enable students to jump more readily into the text.

Because this is a technique that many reading teachers use to prepare their students for the selected reading passage, it is encouraging to see that there is brain research to support this approach. The human brain is designed to process meaning before it processes the details. John Medina (2008), a molecular biologist who has studied the brain extensively, explains the concept in this way:

> Providing the core concept, *first* is *[sic]* like giving a thirsty person a tall glass of water...Starting with general concepts naturally leads to explaining information in a hierarchical fashion. You have to do the general idea *first.* And then you will see that...improvement in understanding (p.90).

Preparing the brain for what it is about to learn can increase the learning. In the case of reading, providing the reader with the overall concept of what they are about to read can increase their comprehension of the text. A thirsty person is going to be

more prepared for what is next if his or her thirst is quenched first. Likewise, if a teacher can 'quench' a child's thirst for knowing what the reading will be about, the child can then more successfully engage in the text.

One way to do this would be to introduce books to the class by giving a brief book talk on the book. I did this with my students when introducing books for book clubs. The five young adult books to choose from were: *11 Birthdays by* Wendy Mass (2010); *Scat* by Carl Hiaasen (2010); *Found* by Margaret Peterson Haddix (2008); *Love, Aubrey* by Suzanne M. LaFleur (2009); and *Schooled* by Gordon Korman (2008). In order to increase the students' engagement with the text, I wanted to allow students a choice about which book to read. First, I showed a book trailer for each book, read the summary from the back of the book aloud to the class, and then briefly presented a description of the book in my own words. The students were given the gist of the book in three different formats. Now that they had an overall picture of each book, each student was to write down his or her top three choices. Based upon that, I then placed the students into books groups. The students could approach the book with minimal teacher involvement because they knew what the book covered and had chosen a book that was appealing to them. The engagement level of the students in these book groups was deep and the learning that resulted as a consequence of that was huge. The general meaning of the book had been presented to them, which consequently meant that they could now focus on the details.

Hook Their Attention-Involve Their Emotion

Think of your favorite movie scene. Does the scene tug at your heartstrings, have you gripping your seat in fear, leave you with tears streaming down your face, or have you seething in anger? Most often, the movie scenes that are imprinted on one's mind are also imprinted on their heart and tangled in one's emotions. This is because "emotionally arousing events tend to be better remembered than neutral ones" (Medina, 2008, p. 79). How can this concept be utilized in the area of reading comprehension? When readers' emotions are involved, they are more willing to invest themselves in the text, which consequently means they are placing more of their attention on the text. And, "the more attention the brain pays to a given stimulus, the more elaborately the information will be remembered and retained" (Medina, p. 74). In this case, the stimulus is the selected reading and the attention is highly engaged which will result in elaborate storage of the information. Elaborate storage of information definitely enhances reading comprehension.

Reading teachers can employ techniques to hook their readers' attention. This is where effective teachers dig deep into their creativity and knowledge of their students to develop strategies that will work to engage the attention of their specific students. If a teacher is introducing a mystery book, the teacher could have a mysterious guest come in during the middle of class, walk in without acknowledging anybody, take something from the classroom, and then walk out. The teacher could then appear enraged and baffled, and sputtering, can ask the students what just happened, and why did someone come into their classroom and steal something that belonged to the teacher, and who was that person, and so on and so forth. The

teacher is allowing her emotions to get aroused and the students will be drawn into this mystery. The teacher then has the students' fully engaged, aroused emotions, and they are participating first hand in the experience of a mystery.

After the concept of a mystery is explained, as the students begin their reading, their emotional experience of a mystery will be firmly planted in their minds. They have an emotional background experience with a mystery and thus know the gist of how the story will be set up. Due to their engagement level and arousing emotional experience, their attention should be heightened as they read, and therefore information they read within the text should be more fully retained and comprehended.

Medina explains the significance of the initial introduction by explaining the timing principle. This principle states, "If you are a student...the events that happen the first time you are exposed to a given information stream play a disproportionately greater role in your ability to accurately retrieve it at a later date" (Medina, 2008, p. 116). The implications for teachers is this, "if you are trying to get information across to someone, your ability to create a compelling introduction may be the most important single factor in the later success of your mission" (Medina, p. 116). Teachers need to utilize that first introduction to really capture their audience. When a teacher introduces the concept of a mystery novel, it is important for students, in terms of comprehension, to be able to recall the elements of a mystery as they read a mystery novel. Activating their background knowledge of a mystery text, will provide them with the necessary knowledge to access the text they are reading. If a student can correctly recall the elements of

mystery novels, then they will have that necessary background knowledge. A vivid initial introduction can make that recall easier.

The brain science behind this ability to recall information is that "the memory of an event is stored in the same places that were initially recruited to perceive the learning event. The more brain structures recruited...at the moment the learning, the easier it is to gain access to the information" (Median, 2008, p. 116). This implies that teachers need to activate more brain structures with their teaching in order to allow their students to later have easier access to that information.

One current area of research deals with "the effect of emotion on learning" (Medina, 2008, p. 80). According to this research, "an emotionally charged event...is the best-processed kind of external stimulus ever measured. Emotionally charged events persist much longer in our memories and are recalled with greater accuracy than neutral memories" (Medina, p. 80). A reader's emotional experience with the mystery introduction will persist in their mind longer than a simple, verbal introduction. After this introduction, a child will be able to recall this event vividly each time they encounter a mystery. This process involves the part of the brain that is in charge of "executive functions such as problem solving, maintaining attention, and inhibiting emotional impulses" (Medina, p. 80). The part of the brain in charge of these functions is the prefrontal cortex, which is similar to a CEO, chief executive officer. The CEO has an assistant, the cingulate gyrus. Like all assistants, the cingulate gyrus has many roles to play, but one of his most important jobs is to communicate with the amydgala, which is the hub for creating and maintaining

emotions. Inside the amygdala, one will find a neurotransmitter by the name of dopamine. Medina (2008) describes the amygdala's use of dopamine as mirroring an office assistant's use of Post-It notes: When the brain detects an emotionally charged event, the amygdala releases

> dopamine into the system. Because dopamine greatly aids memory and information processing, you could say the Post-It note reads, 'Remember this!' Getting the brain to put a chemical Post-It note on a given piece of information means that information is going to be more robustly processed. It is what every teacher...wants" (p. 80-1).

If a teacher can trigger the amydgala to Post-It note the emotionally charged mystery introduction, the readers are more likely to remember that event and the learning that occurred as a result of that introduction. This in turn will aid their reading comprehension as they continue to investigate and explore mystery texts.

A good teacher will be able to 'bait the hook' with emotional appeal for many books. In going along with the mystery theme, the children's book *The Top Secret Files of Mother Goose!* (Gosling, 2003) is sure to get young readers engaged. This fascinating tale written by Gabby Gosling reveals the hidden identities of familiar storybook characters. Because children are already familiar with some of the characters in this story, they will have sufficient background knowledge to interact with the text early on in the story. If the introduction to mysteries was emotionally charged, then the children should be able to recall the information that the amygdala Post-it noted during the introduction. As the children engage in this

mystery text, their comprehension will be greater as they synthesize information from the introduction with their current reading.

Using Words AND Pictures

When teaching reading, teachers should be sure to include pictures. Research has shown that the saying, "a picture is worth a thousand words" actually carries a lot of truth. In John Medina's book *Brain Rules* he implores teachers to use pictures to transfer information. In urging teachers to do this, he writes, "There are things we know about how pictures grab attention that are rock solid" (Medina, 2008, p. 237). The evidence for using pictures in teaching is there, reading teachers now simply need to apply pictures in their teaching. Richard Mayer, a cognitive psychologist, has devoted much of his research to "exploring *[sic]* the link between multimedia exposure and learning" (Medina, p. 208). Throughout his years of research, Mayer has developed multimedia principles which "link what we know about working memory with his own empirical findings on how multimedia exposure affects human learning" (Medina, p. 210).

A couple of these findings carry significant weight for teachers and can certainly be applied to the teaching of reading. His first principle, the multimedia principle, states, "students learn better from words and pictures than from words alone" (Medina, 2008, p. 210). Pictures carry great meaning and readers should be encouraged to use the pictures within the text to aid their comprehension of the material. Readers should be taught to look for clues in the illustrations that will provide them with context clues, help them figure out unknown words, and enhance their overall understanding. Reading teachers can explicitly teach this strategy to

readers. For beginning readers, teachers can model reading a story by simply telling the story through the pictures, sans words. If students can first learn to be successful by searching for picture clues, they are going to have that strategy to fall back on when the words present a challenge for them.

When teaching a certain reading strategy, such as looking for pictures clues, teachers can also use a picture to symbolize that strategy. Maybe the teacher will choose an eagle because if a reader has 'eagle eyes' it means they are using both the words and pictures to hunt for textual cues. The teacher can then make a sign with the eagle on it, and use words to briefly describe the strategy. The teacher is using good brain research strategies by presenting information in both word and picture format. Later on as the teacher is reminding students of this particular strategy, the sign with the words and pictures can be used to jog the children's memories and remind them of the importance of using the pictures to aid them in their reading.

Less text and more pictures is an idea that was embodied in the newspaper *USA Today* when it first originated in 1982 (Medina, 2008, p. 238). Due to the minimal text present in the paper, many did not expect the newspaper to be around for long. However, "within four years, *USA Today* had the second highest readership of any newspaper in the country, and within 10, is was the number one. It still is" (Medina, p. 237). Not only do pictures aid in the learning process, they are also appealing to readers. The human brain is hardwired for visual stimuli. Medina claims that the human brain responds to pictures in this way because pictures provide "a more efficient way to glue information to a neuron" (p. 238). The more neurons and neuron pathways involved, the more permanent the learning. Because

of this principle Medina writes, "there may be strong reasons for entire marketing departments to think seriously about making pictorial presentations their primary way of transferring information" (p. 238). This is strong evidence, and it should cause teachers, especially teachers of reading, to think about the way that they are currently transferring information to their learners.

Books without words can be a powerful learning tool for children as they search for meaning solely within the pictures. Readers learn that pictures can provide powerful details to a story. The Carl books by Alexandra Day (1985) have only a few words on the first and last page and the rest of the story is told in pictures. As children explore these books they will discover that reading does not always have to involve words. These are valuable books for children to explore or to be 'read' aloud and discussed with students. The stories they will tell as they create words to go along with the pictures will reveal the author inside of them. A great activity to go along with these wordless picture books is to have children create a verbal dialogue in conjunction with the pictures. These pictures will be memorable and powerful teachers for young children.

Encourage Exploration and Develop a Sense of Wonder

Have you ever watched a child laugh in delight as they spot the first snowflake of the season? Or watch their eyes open wide with wonder as they spot a squirrel stuffing its cheeks with nuts and seeds? Or watched their curiosity expand as they ask question after question after question? One of the most beautiful and innocent things about children is their sense of wonder and curiosity. Too often, in the name of good teaching, this natural sense of wonder is squelched. But a good

reader needs that desire to explore and that sense of wonder to enhance understanding. A good reader asks questions as they read and those questions increase their understanding. Reading teachers need to use that innate sense of wonder within in a child to spark their reading comprehension.

In John Medina's book *Brain Rules* he describes a scene where his young son was walking down the sidewalk and delighting in the small things he saw. Things like a line of ants, a shiny pebble, or a weed (Medina, 2008, p. 278). His son's sense of exploration reminded him of the importance of curiosity in learning. He thinks there are many ways in which classrooms need to be redesigned, and a redesigned classroom would have curiosity at the heart of it. Teachers need to capture that desire for curiosity and exploration because this will motivate students. If students can follow their natural curiosity and are then given some choice so that some of their learning capitalizes on those areas of interest, children will be more motivated to learn.

David A. Sousa is internationally known for his research on the brain and the impact of that research in the classroom. Sousa (2005) writes, "Motivation is the key to successfully learning a skill because it keeps students interested in paying attention and in practicing the skill" (p. 68). Reading is a skill that needs to be continually practiced in order to achieve success. Fluency does not happen without practice and comprehension does not happen without fluency. Sousa mentions that, "reading instruction needs to include motivational strategies and texts that keep students interested and thus sustain attention" (p. 68). Brain research points to the significance of motivation in the learning process. So, if teachers can give students

choice in their learning, thus sparking their curiosity, their motivation and desire to learn should increase. As they are more invested in the text they are reading, their reading comprehension will increase because of their increased attention to the task at hand.

A simple way reading teachers can provide students with some choice is by allowing students some freedom in the text they choose to read. Sousa (2005) has found that:

> New reading that the child finds interesting is likely to make it past immediate memory to working memory for conscious processing. And if the new reading activates material recently learned, long-term storage retrieves that information and moves it into working memory where it enhances the acquisition of the new learning" (p. 50).

The power of finding new reading in which the child has an interest, can have profound effects on the child's learning, brain research supports that. Following a child's interest and fanning their curiosity sparks deep learning and activates both working and long-term memory.

Teachers should also allow small choices such as permitting students to pick a partner to read with, or to choose to read on their own. Those simple aspects of choice give children a sense of empowerment over their own learning. And this sense of power increases their motivation. There are many small and simple ways teachers can provide reading choices which will allow students to explore something that is personally motivating.

This technique can be done in simple formats within the classroom. However, developing a sense of wonder can also have more drastic approaches in a class. According to the National Institute of Literacy, another effective "strategy for developing comprehension focuses on reading and other activities related to a central theme" (Sousa, 2005, p. 101). Because the various classroom activities center on this theme, students can more easily comprehend their related reading. A strategy called Concept-Oriented Reading Instruction (CORI) is one way this could look in a classroom. This process consists of 4 steps: observe and personalize, search and retrieve, comprehend and integrate, and communicate to others. In one school, CORI was implemented in this way: third grade teachers chose a unifying theme for their students to explore. This conceptual theme in the fall for third-graders was "the adaptations and habitats of birds and insects" (Sousa, p. 102).

The unit opened with students performing observations, conducting hands-on experiments, and "composing their own questions as the basis for observing, reading, and writing" (Sousa, 2005, p. 102). The teachers were involved with guiding the learners instead of simply directing them. The students came up with questions with a structural and contextual focus that sparked their curiosity and that they were interested in exploring the answer. One example of a structural question was, "How many types of feathers does a bird have?" Students developed their own questions and were deeply involved in self-directed learning. For this unit, "students chose their own subtopics, found particular books, selected peers for interest-based activities, and constructed their goals for communicating to others" (Sousa, p. 102). This epitomizes exploration at its best.

The students were then ready for the second phase of CORI where students sought answers to the questions they had posed during the first phase. Throughout this unit students were:

> ...taught how to use the library, find books, locate information within expository texts, and use a diversity of community resources. In addition, direct strategy instruction was provided to help students integrate information across sources including texts, illustrations, references, and human experts. Along with information texts, woven through the instruction were stories, folklore, novels, and poetry. Most of the teachers began the units with a narrative related to the theme that students read at the same time they were conducting science observations" (Sousa, 2005, p. 102).

So much reading was taking place. The variety of reading experiences the children were receiving and the vast amounts of learning that was occurring was huge. Students then communicated their learning to others. This learning could take place in a variety of forms and students chose a form of communication with which they were comfortable and one that they thought was the best and most effective way to communicate their particular learning from the experience.

CORI is a wonderful way to teach reading. It allows students the freedom to follow their own curiosity within a framework that will allow them to be successful. The students are motivated to learn, work with others, and are able to integrate a variety of information because it is all surrounded by one unifying theme.

The topics that one could cover while using the CORI approach are endless. With any topic that is chosen, it is important to have books on the topic from a

multitude of genres. If doing the study above about adaptations and insects a great fiction book to introduce is *The Very Hungry Caterpillar* by beloved author and illustrator Eric Carle (1994). The children can use their insect schema to evaluate the book or this could be used as an activity for them to share what they already know about insects prior to the study of insects. With any topic chosen, there are bound to be valuable resources to be discovered in children's literature.

Picture Walk

Activating a reader's schema prior to the reading of a text can provide students with access to their background knowledge. Sousa recommends that, "teachers of reading should consider using strategies that activate the reader's prior knowledge thus enabling them to better understand the text" (2005, p. 53).

Armbruster, an educational psychologist, proposes a picture walk as one effective strategy. A picture walk can look different depending upon the text being read and the way a teacher chooses to do it. One method is simply to have the students read the title and headings and flip through the book and look at the pictures to predict what the story is going to be about. If a child is taking a picture walk through a story and sees many pictures of pigs, then prior to even reading the text, the child will activate his pig schema and have that knowledge of pigs ready for the actual reading. The schema has been activated which makes it easier to add new knowledge to the existing schema and to modify the schema based upon new learning.

A teacher could also choose to do an oral picture walk where the students converse about what they see in the pictures and thereby make predictions about

what might happen throughout the course of the story. This can be an independent activity, could be conducted in small groups, or could be teacher led. This technique, which emphasizes the strategy of accessing background knowledge, allows the teacher to quickly adapt the lesson based upon what the students need at the moment. The teacher can easily model this for the children, and can continue to model before future read alouds. This is especially effective for older students as well as they are reading course related content materials. Previewing the text in this way allows the "students to get an overview of the content and organization of the reading by skimming the head notes, captions, summaries..." (Sousa, 2005, p. 105).

Doing a picture walk is useful for just about every book that includes pictures or graphics of some kind. *Alligator Baby* by Robert Munsch (1997) provides a good framework for a picture walk. The students can first discuss why do they think it is called *Alligator Baby*? What do they predict it is going to be about? As the children look through the pictures they will begin to get a sense of what the book is about. This book has some challenging vocabulary for young readers, especially the animal names. However, if children are able to preview the book, the pictures will trigger those animal names in their mental lexicon and by the time they are ready to read the book, those animal names will be ready to be read fluently. This is just one example of literature where a picture walk could be conducted; the opportunities for effective picture walks are endless.

Making Connections

Critical readers make connections between what is read and their own lives. By taking in the material and applying it to their own lives, readers increase their

comprehension of the text. They must understand it in order for them to be able to see connections between the text and their life. In order to be successful at making these connections, good readers must use their schema, the sum total of their background knowledge and experience (Harvey & Goudvis, 2000, p. 21). Stephanie Harvey, a leader in reading education, knows the significance of schema and the impact it can have on reading comprehension. In speaking of this she writes, "Applied to reading, we can activate and use schema theory as we guide students to make connections between books and their own lives" (Harvey & Goudvis, p. 21). The importance of making connections is clear, however students need to have this process demonstrated for them so they are able to carry it out and apply it to their own reading and so they can see the significance this strategy has on their comprehension of a story.

When students have experienced something that a character in a story is going through, students are able to more easily understand the motives behind what a character is doing, the thoughts that might be going through that character's head, and the emotions that the character is feeling. Students need to be taught how to put themselves in the character's shoes so that they can experience what the character is going through. This is the importance of "text-to-self" connections. In order to use this strategy successfully, students make connections between the reading and their personal experiences in relation to their background knowledge. A student's understanding of the story is increased because the reader is experiencing what the character is experiencing.

Text-to-text connections are another useful tool. While using this strategy, students make connections between the current reading and other texts they have read. This can be in the form of books, poems, songs, comics, or any other written material. As students make these connections, they are strengthening neural pathways in their brains. In addition to making text-to-self and text-to-text connections, readers can also employ text-to-world connections. Students notice similarities between the reading and events in the news, cultural issues, and the world at large. By constructing a view of how this particular reading fits into the grand scheme of things, they become aware of the importance of reading and the significant issues that can be found within a text. This serves to broaden their view of the text, reading in general, and worldly events.

Brain research has proven that, "memory is enhanced by creating associations between concepts" (Medina, 2008, p. 84). As the brain makes connections between the reading and the reader's life, other known texts, and events happening worldwide, the concepts in the text come to life and those associations enhance the reader's memory. The reader's schema is enlarged and information is assimilated. Connections are important and greatly impact a child's reading comprehension. Stephanie Harvey realizes the importance of creating solid connections to literature. Harvey (2000) also notes that:

> Readers...make connections to the nature of different texts and build schema for that...as readers are exposed to a wider variety of genres, forms, and structures, they become increasingly aware of literary and style

characteristics. They soon come to expect certain features in different texts. This, too, enhances their understanding when reading (p. 21).

One of the wonderful things about the CORI approach that was talked about above, is that it helps children make these vital connections because it exposes children to a variety of literature genres in an environment where children are given the freedom to explore a topic with which they have connections and want to form even more connections.

Once children get the hang of making connections and how it deepens their understandings of the text being read, they will begin to readily make connections between the text and their lives, the text and other texts, and the text and the world. When first introducing this strategy a book that many children will readily connect with is the endearing picture book *Owen* by Kevin Henkes (1993). In this book the main character, Owen, is presented with the problem of giving up his beloved blanket. Many children have or have had a special blanket, stuffed animal, or dearly loved possession and they can readily connect with Owen and feel his desire to cherish his blanket and his refusal to give it up. As children begin discussing their personal connections, the teacher can guide them to think about how those connections helped them as a reader. Children will enjoy thinking about connections as they read and this will make their reading more personal and enjoyable.

Capitalize on the Brain's Ability to Recognize Patterns- Predictable Text

The human brain is "a terrific pattern matcher" (Medina, 2008, p. 84) and teachers should capitalize on the brain's natural ability and inclination to search out patterns. The brain is programmed to pay more attention to something that it

recognizes which is thus why it seeks out patterns. Non-fluent readers read text word by word. Because their brain is so focused on the decoding of the words, often much of the comprehension is lost. Skilled readers, however, "scan the text searching for patterns that will make the task of reading easier" (Sousa, 2005, p. 61). In Sousa' book *How the Brain Learns to Read* he illustrated this concept with a little experiment. This is the duplication of the experiment:

Look at the following block of text and note any irregularities:

Q Q Q Q Q Q Q
Q Q Q Q Q Q Q
Q Q Q Q Q P Q Q
Q Q Q Q Q Q Q
Q O Q Q Q Q Q
Q Q Q Q Q Q Q

What do you notice? Most people will spot the letter 'P' almost immediately, but miss the letter 'O' in the fifth line (Sousa, p. 61).

The brain notices something that clearly infringes on the pattern, and yet selective vision has trained the eyes to "skim over something that very closely resembles" the pattern (Sousa, p. 62). This is one important factor that allows the brain to read faster because our brain quickly picks out word patterns and can ignore slight irregularities that may not hinder the reading.

Because the ability to recognize patterns is so hard-wired into the brain, using books with a pattern, or predictable text, can significantly increase a reader's comprehension of the text as their brain is able to sync itself with the pattern. As a student reads a book with a built in pattern structure, the brain will eventually catch onto the pattern. However, because studies have shown that "teachers should emphasize text comprehension as early as the primary grades, rather than waiting

until children have mastered reading basics" (Sousa, 2005, p. 98), an effective teaching strategy to aid comprehension is to point out the pattern in a book prior to the actual reading of the text. Teachers of reading should preview text with a child and help them notice the pattern. In this manner, the child's brain is able to recognize the pattern as soon as the reading has begun, freeing up more space in the working memory for comprehension. Books with rhyming patterns are especially beneficial for this as the brain can predict what word should come next based upon the rhyme scheme. Books with predictable or repeated text and phrases are also beneficial. Each time the child reads that phrase, they are gaining fluency as they are practicing those specific words time and again. This practice is also helping low-frequency words to become high frequency words in the child's mental lexicon. Not only is that phrase eventually able to be read fluently, but the brain also spends less time reading that phrase because it recognizes the pattern of repetition.

In the world of children's books, there are a plethora of stories with predictable rhyming schemes and repeated phrases. The perennial classic *Brown Bear, Brown Bear What Do You See?* by Bill Martin Jr. (2008) is well loved for good reason. The reader is presented with one large picture on each page. The teacher can point out that the animal seen on each page is the animal that will be talked about first on that page; that is pattern number one. For pattern number two, teachers can point out that each page begins with a question, and is then answered by one statement. The use of patterns does not stop there but rather continues as the color of the animal on each page comes before the name of the animal on the page. As teachers are doing this, they can have the child doing a picture walk

through the story and prompt them with questions such as, "What is the animal on this page? Since it is a bear, what word would we expect to see? Can anybody find that word? What color word is going to be on this page? Who can point to the color word? How did you know that said brown?" In this way the children are interacting with the text and beginning to predict the pattern for themselves. In addition to those patterns, there is also the repeated text "___what do you see?" and "I see a ____ looking at me." Children will also discover the pattern that the last animal talked about on one page is the picture that will be on the next page. The many patterns in this book play right into the brain's ability to recognize patterns. This will serve to increase a child's fluency and comprehension.

Cross Training

In his book *How the Brain Learns to Read*, David A. Sousa makes a very valid point about learning any new skill. Sousa (2005) writes, "Learning any skill is easier if it can be supported by other skills the students already knows or is learning at the same time" (p. 68). Often times, the teaching of reading or aspects of reading, are taught in seclusion of one another. This makes it harder for the brain to connect all of the pieces and form it into one cohesive unit. On the flip side, if teachers can help to unify the teaching of reading and bring "together a wide range of skills that reinforce overall comprehension of the material" (p. 68), teachers will see accomplished readers as a result. In order to be a critical reader, one needs to practice proficiency in multiple areas and this cross training technique will help develop that proficiency.

One benefit of this approach goes back to the importance of practice. If children are truly 'cross training' in reading, then they will practice reading in multiple, meaningful contexts. In the classroom, this might involve building a student's vocabulary as that is an important building block for reading comprehension. A child's oral vocabulary coincides with the ability to comprehend a reading passage (Sousa, 2005, p. 91). Thus initiating classroom discussions and encouraging small group work will allow that oral vocabulary to blossom. The reader's spoken language fluency will increase which will serve to aid his or her comprehension. As children engage in these discussions, they will be able to make more connections in their reading because they will now have a better understand of text connections because their knowledge of the world has expanded.

The CORI strategy incorporates a lot of this cross training as children are actively reading in science and reading in a variety of genres, engaging in rich discussions, developing a new vocabulary to discuss scientific ideas, and increasing their oral fluency as they communicate their learning to others. Even if CORI is not a method that is used in the classroom, this cross training can be done on a smaller scale by incorporating beyond-the-surface-level comprehension of content area text. Being selective in the text used in content areas will also help to provide rich discussions if teachers choose books that will allow for deep discussions. Purposeful and meaningful selection of texts is key. This may mean bringing in more historical fiction, excellent picture books, and non-fiction texts into the social studies classroom instead of simply relying upon the textbook. This will increase enjoyment of the reading, ensure that students are receiving quality literature, allow for more

personal connections to be made, and bring in effective reading to the social studies classroom. Suddenly, social studies will be just as much about reading as it is about the study of culture.

In social studies, when discussing the oppression of African Americans in America after the abolishment of slavery, a useful book to read to supplement information found in a textbook is *Roll of Thunder, Hear My Cry* by Mildred D. Taylor (2005). This book could be read prior to introducing the material in the textbook, after the textbook has been read, or the book could be read in conjunction with the textbook. Reading comprehension will improve as students become emotionally involved in this heart-tugging story. This well-written book does a more thorough job of explaining what it felt like to live during this time period than most textbooks can do. Having such rich reading in social studies will carry over to a student's reading in non-social studies classes because students are actively engaged in reading activities outside of Language Arts class, thus they have more reading practice and exposure to reading. Reading a novel in social studies also provides teachers with more opportunities to provide support strategies for their readers.

Literature Circles

Discussing one's ideas with a group, and learning from the comments that others add, will aid a student's comprehension. Literature circles are a fabulous way to construct discussions within a classroom. This is done in small groups, which eliminates the fear that some children experience when they must discuss their ideas in front of the whole class. The small group format also allows for opportunities for all children to participate. This is an effective way to provide

learners with reading instruction combined with book choice. Sousa (2005) suggests that the groups be formed by allowing students to choose the group based upon book choice and not ability (p. 84). Ability grouping can be an effective way to form groups at times, but as has been previously stated, providing children with choice will increase their motivation which in turn will raise their involvement and thus their understanding of the text.

These are student-led groups and the teacher is often not present. Some teachers choose to set it up in a way that the teacher rotates between groups on certain days of the week, which thus allows the teacher to check in on the groups, monitor their progress, and answer questions. These groups discuss characters and events within the book and then relate their own personal experiences to the story. They are building those ever so important connections as they converse about the book. The teacher can provide guiding questions for these groups or not depending on whether the teacher has certain topics that he or she wants to make sure are discussed in the groups, or if the teacher wants to put the students fully in charge of the topics being discussed. In order to encourage everyone to participate, often times each student is assigned a job, such as word finder, discussion leader, artist, note taker, etc. each time the group meets. These jobs can then be rotated throughout the duration of the group. Sousa finds great value in these groups and has seen that the process of discussing books in such a format "helps students engage in reflection and critical thinking as well as construct meaning in their interactions with other students" (Sousa, p. 84). Connections are being built, cross training is happening, and deep discussions are taking place. Literature groups

incorporate many effective reading strategies and can be done in nearly all grade levels.

Beverly Cleary's (1992) *Ramona* books are loved by many. These books are ideal for literature circles because they present issues to which many children can relate such as problems with siblings, the death of a beloved pet, and the importance of staying true to oneself. Since these groups are student-run, the teacher will not always be present within the group to keep the discussion going and to prompt the children to make connections. Consequently, teachers should choose books that children can discuss deeply with minimal teacher support. The *Ramona* books are funny, engaging, and should provide many discussion worthy topics for young readers.

Read Aloud

When learning any new skill, it is important to have that skill demonstrated appropriately. Good teaching involves continually modeling. One of the best ways to model reading for students is to read aloud to students. This is something that is common in the primary grades, but it is often neglected in grades beyond that level. Teachers modeling good fluency enable their students to understand how a reader's voice can help the story make sense. It helps punctuation, text features, and the author's voice come alive. It also shows the students the enjoyment that can come from reading and getting involved in a text, allows the teacher to guide whole class discussions, and model effective thinking strategies. The amount and variety of strategies one can model during a read aloud are without limit. A teacher can model strategies, get the students involved, communicate a love of learning, and so much

more. A valuable read aloud will be selected with intentional strategies in mind. Naming the specific strategies that the readers are using is important because the students should know why they are completing a particular action, how it helps their reading, and what it is called. Naming the strategy provides the language to talk about what the reader is actually doing while they are reading. Teachers should be purposeful in guiding students throughout the course of the story with planned stops, thoughtful questions, and think alouds before, during, and after the read aloud. There are few reading strategies more effective than a well-structured read aloud.

It is also effective for teachers to model how to read a certain selection of text and then provide the students with opportunities to re-read that same text. Students then have the background knowledge required for the story and have a model to follow on what the text sounds like when read fluently. The more models of fluent reading the students hear, the better it is for the students' reading. As students read the text fluently, their working memory will have more capacity for higher-level thinking, comprehension, and application. At least one daily read aloud, regardless of the age of the student, will serve to be a valuable resource in any and all classrooms. Using read alouds daily "increases the children's vocabulary, their familiarity with the written language, and their knowledge of the world" (Sousa, 2005, p. 86).

Teachers use a large variety of books to conduct effective read alouds. The important thing to remember is that choosing a poor mentor text limits the depth of the read aloud. In Deborah Corpus' book, (Corpus & Giddings, 2010, p. 58) she

demonstrates how she used David Adler's (2005) book *Joe Louis: America's Fighter* to guide a read aloud for her students. With just this one text she was able to "model making connections, visualizing, inferring, asking questions, and synthesizing" (Corpus & Giddings, p. 58). The read aloud was set up so effectively as to also focus on "wonderful writing: sentence fluency, the use of an effective analogy, selecting the perfect word" and that is not all. She was also able to highlight "a particular reading strategy: determining important ideas and organizing them in a way to make them memorable" (Corpus & Giddings, p. 58).

Corpus and Giddings (2010) are attuned to the findings of brain research and write, "We know that kids can't learn if they aren't attending. Using a book with an emotional hook and a problem to solve can involve them both emotionally and intellectually" (p. 58). They understand the significance of emotions to the process of learning and comprehension, and Corpus has thus used the emotional hook in *Joe Louis: America's Fighter* to her students' advantage. Throughout the read aloud she was able to involve her readers in the text in many ways by using expressive reading, having students make predictions, turning and talking to their neighbor, and other strategies that pulled her readers into the story. Corpus and Giddings describe a mentor text as being "a powerful piece whose content and writing style touch us intellectually and emotionally" (p. 58), and she used the book about Joe Louis as a truly effective mentor text for her read aloud.

Shared Reading

Shared reading is a reading activity that is interactive, allowing the students to participate in much of the reading of the text. One important feature of shared

reading is that a teacher uses a large book for the instruction. The book is placed where all the children can visually see it; it is often placed on an easel so all children have access to it or placed under a document camera so that it can be projected to the entire class. Sometimes, the teacher reads the entire text aloud while pointing to each word, often with a pointer, as she reads the word. Other times, the teacher has the class read the book with her from the start. The teacher may stop and ask children to "predict a word or phrase or summarize what is happening "(Sousa, 2005, p. 85). The second time through, the students may read the whole text with the teacher, the students may choral read the text, or sometimes teachers choose to have the class echo read. If the text is one with dialogue, or if it is a poem with stanzas, or a song with verses and a chorus then the teacher may divide the class in two and have different sections of the class read different parts. The variety of things that can be done during shared reading are numerous. The key to shared reading is that children are all looking at the text while the teacher is reading and that the students are asked to be active participants.

The children are often exposed to this text more than once, although they may be asked to interact with the text in a different way each time it is read. The brain needs repeated practice with a purpose, and this is what this strategy entails. It is not mindless rereading of a text. Instead, each rereading has a distinct purpose. This practice with the text develops fluency, and fluency in turn aids in comprehension. Sousa believes the goal of shared reading is, "to work toward phrase fluency rather than reading the text word by word" (Sousa, 2005, p. 85). For beginning readers this also develops their print concepts as teachers model how to

track, reading from left to write, and introduce reading 'jargon' attached to a concrete concepts such as letters, words, and sentences.

One important brain research component of shared reading is the repeated exposure to text. The more practice and exposure students have with words, the more fluent their reading becomes. Because the teacher is pointing to each word as she is reading it, children see the relationship between the way the words sound and the way the word looks. Incorporating sight and sound increases a child's reading memory. The teacher is modeling what it sounds like to read fluently and children are imitating that fluency which is in turn giving them an opportunity to practice fluency. Patricia Cunningham is one of the leaders in the field of reading education and has written many books on this topic. She is an advocate for shared reading and she believes that shared reading is important for a variety of reasons, one of them being that as children participate "they experience what reading is. They know what it feels like and sounds like and, most importantly, they develop the confidence that they can learn to read" (Cunningham, 2009, p. 10). This confidence serves as a motivator for them to read more. And, it has been shown that motivation is a key component of real reading.

David Shannon, a children's author, has become well loved by children in elementary classes across the globe. His simplistic, childlike drawings united with humorous stories to which children will immediately be able to relate are a winning combination. His short books illustrate how simple picture and few words can still dictate a lot of emotion. The humor and emotional appeal draws students in, and the limited use of text make the books appear less intimidating to beginning readers.

The book *No David!* (Shannon, 2000) uses lots of expressive punctuation and is effective for shared reading as the teacher can model how to read punctuation. The students will be drawn into the story, the repetition of the words will add to their high frequency words, and it will give them the confidence that they can read the book on their own. The process of shared reading will benefit the children when they read the book during an independent reading time.

Tape-Assisted Reading

It is common practice in many classrooms to have a listening station. This station usually consists of headphones and a pre-recorded reading of a book with the corresponding text. The children are able to go to the listening station, select a book and the appropriate tape and follow along with the text as the book is being read aloud to them. This is not a new idea and veteran teachers will admit that they see great value in this activity. Now, there is brain research to back up the validity of what teachers have been doing for years.

According to David Sousa, in order for students to get the most benefit out of tape-assisted reading, there are a few steps that readers should follow. The tape should consist of a fluent reader modeling appropriate reading. Another purposeful and motivating way to have students practice reading and rereading, is to have them record books on tape for their class, others classes, and even other grade levels. This is effective for most students, and is extremely beneficial for a reader that needs additional help in the upper grades. This upper grade level student now has a purpose for reading lower level books, and as that child is reading and rereading 'simple' books, he is building his fluency and aiding his comprehension while being

motivated to help younger students. This is practice with a purpose. The reader should understand how different punctuation is read, the importance of proper intonation to the meaning of the story, etc.

The goal of this method is that learners are able to follow along with the reader on tape, therefore the recorded reader should only read about 80 to 100 words per minute (Sousa, 2005, p. 85). The first time through the text students should read the passage to themselves, the second time through they follow along with the tape and point to the words in the book as they read them, and the third time students should read the text aloud in conjunction with the tape. A student should continue to read along with the tape until the student can read the text independently. This has great brain research behind it. This method involves multiple senses as the child is listening to the words, looking at the words, and touching the words on the page. The repeated practice with the same text builds fluency. And fluency is so important to developing comprehension. Fluency and comprehension in one text carries over to other texts as students gain confidence and become proficient in their strategy usage. Books on tape should not be overlooked for their effectiveness.

*If You Take a Mouse to School* is a book in the Laura Numeroff (2002) series *If You Give a...* and features the mouse character that is present in many of the other stories in the series. Having a familiar character and similar structural set-up to the other stories will provide the reader with background knowledge and will help the readers' brains more quickly catch on to the pattern that is present. The recording for this story models excellent reading fluency at a pace with which a young reader

can follow. Teachers should be encouraged to use recordings in their classrooms whether the recordings are made by the teacher, students, the author, or another outside source. The more experience children have with hearing fluent readers the better.

Readers' Theatre

Readers' Theatre is an enjoyable format for reading that provides very purposeful rereading of a text. When doing a readers' theatre, students rehearse, although memorization is not expected, a play. This play can be performed in their small reading groups, in front of the class, for another class, the options are many. Many books can be adapted for Readers' Theatre, and it is encouraged that the script be taken from a book with rich dialogue. The students become the characters in the play, and a "narrator may be used to give any necessary background information" (Sousa, 2005, p. 86). This is not intended to be a large production, so an allotted time for practice over a couple day span should be sufficient.

Patricia Cunningham knows that fluent readers become fluent readers by rereading the same text. The first time through a text, a lot of attention may be focused on word identification. The second time through, learners "are able to read phrases as their brains put the phrases together into meaningful units" and the third time through, learners "read more rapidly with good expression" (Cunningham, 2009, p. 81). The Readers' Theatre approach is an excellent way to achieve those multiple reads of a text but in an intentional and motivating way. The students do not become weary in the rereading of the text, because they are motivated to practice in order to perform well. Sousa (2005) promotes Readers' Theatre as "an

enjoyable opportunity for rereading text, practicing fluency, and promoting cooperation" (p. 86). The students must read with expression, make the punctuation come alive, and their comprehension is enhanced. The benefits are many.

In one study conducted in 1999, students participated in various Readers' Theaters for a period ten weeks. In this ten-week time span, these readers "made an entire year's gain in improving their reading rates" (Sousa, 2005, p. 86). Brain research supports the significance of repeated readings and Readers' Theater is an engaging, and proven way, to involve students in purposeful rereading of a text.

There are many resources on the Internet where teachers can find texts that have already been reworked into a Readers' Theatre script. However, a teacher can also choose to rewrite a picture book into a script simply by assigning parts or typing up the text and then assigning children parts as the narrator and different characters. The Pigeon is a very popular character created by Mo Willems. The book *The Pigeon Finds a Hot Dog* (Willems, 2005) is a book that two children could easily reenact. In this picture book there are two characters: The Pigeon and The Duckling. The words are few and are placed in speech bubbles on the pages. The background is plain, which means it does not distract from the words. Even though the drawings are simple, Mo Willems is able to convey a lot of emotion through his characters' expressions and through the way the words are written on the page. This visual depiction of emotion enables young readers to know how the character is feeling and read the text accordingly. The Readers' Theatre is an engaging way to read and makes the text come alive.

Repeated Exposure to Vocabulary

An extensive vocabulary is a good predictor to reading ability. Vocabulary, "the words we know that allow us to communicate effectively" (Sousa, 2005, p. 90), is key because reading is a way to communicate, and in order for that reading to become knowledge, the information needs to be communicated effectively to the reader. Research has shown that "oral vocabulary becomes the basis for comprehension in reading" (Sousa, p. 90). The word needs to be in the child's mental lexicon for it to be easily understood. If the word is not in the child's mental lexicon, then children need to be taught specific strategies as to other methods of figuring out the meaning of the word. Consequently, if a child's oral vocabulary is sparse, there will be significant gaps in the child's reading comprehension. Therefore, direct instruction aiming to increase a child's vocabulary can serve to increase that child's reading comprehension.

In Sousa's (2005) findings on the correlations between vocabulary and reading comprehension, he has found that "scientific research on vocabulary instruction reveals that some vocabulary must be taught directly but that most vocabulary is learned indirectly" (p. 91). Through everyday conversations and readings, children learn a large amount of vocabulary. These everyday experiences present opportunities to learn everyday vocabulary. However, some vocabulary, especially words representing complex concepts, need to be taught through direct instruction.

Teachers should set aside time to teach vocabulary. There are certain guidelines to think about when selecting words to teach, when choosing which

strategies to teach, and when thinking about how many words are selected. One key for this instruction to be effective long term is repetition. Children need repeated exposure to the vocabulary in many contexts. The more the word is presented, the more permanent the learning. In Medina's (2008) research on this topic he found that "repeated exposure to information...provides the most powerful way to fix memory into the brain" (p. 132). This is because this gradually builds the neural networks and allows them to reformat and add to the previous learning, instead of interfering with the learning. Teachers often teach one set of vocabulary words one week, and then move on to a new list the following week without ever reviewing or using the old words. This does not aid the child in terms of helping them to permanently store those words into his or her long-term memory. Humans need to "deliberately re-expose themselves *[sic]* to the information if they *[sic]* want to retrieve it later" (Medina, 2008, p.133). Focusing on a multitude of words for one week does not provide the exposure and re-exposure that is required.

When selecting vocabulary to teach, teachers often choose a large number of words. However, because the capacity of working memory is so limited, this overwhelms the brain and frequently causes few words to be retained. Sousa (2005) recommends teaching no more than 5 words per lesson for elementary students (p. 93). By choosing a smaller number of words, each word is able to be studied in more depth, which will result in great comprehension for the child and allow more words to be stored in the mental lexicon.

When selecting words, teachers should look for words that children will actually encounter again. Choosing to focus heavily on words that are extremely

rare means that children will not be re-exposed to those words. In addition, those words do not help comprehension because children will not come across those words in books. So, instead of choosing rarely used words, select words that may address critical components of the text and that the child is likely to see again. This way the children will be familiar with a larger number of words in the text they read.

The importance of read alouds has already been introduced, however another caveat for read alouds is that they aid in vocabulary acquisition. When a text with challenging vocabulary is read aloud, students learn the vocabulary better than if they were to read it themselves. In order to maximize the learning, the teacher should involve the students in discussions before, during, and after the text is read. Sousa (2005) also mentions that this enables the teacher to "help students attach meaning to unfamiliar words by connecting them to past knowledge and experiences" (p. 93). Connections aid comprehension, so if students can be taught to make connections between the vocabulary and their background knowledge and previous experiences, learning will be enhanced.

Another strategy that combines vocabulary and read alouds is referred to as word harvesting. With this strategy, prior to the reading of the story, the teacher tells the students to keep their ears open for interesting words they hear throughout the book. The teacher can pause at certain words and have students discuss them, students can point out words, or teachers can have students write down words throughout the story and then wait until the end to discuss them. The format can be varied as long as words are 'harvested' from the reading. Many teachers then choose

to add these words to a word wall in the classroom. In order to expound on this learning, the teacher should use, and encourage students to use, those words in their speech and in their writing. If one of the words that is harvested is 'grand,' then the teacher can easily use that word when referring to the quality of student work or the amount of fun that was had. The key is using repeated exposure to vocabulary to increase the words in a child's mental lexicon.

Encouraging children to play with and manipulate words will help them to understand how words work and how parts of words, such as suffixes and prefixes, work together to change the meaning of root words. Giving children sections from books and having them change the words to include more colorful word choices will engage them with the challenge of finding alternative ways to say the same thing. Generating a classroom chart of other words for 'good,' 'said,' etc. will not only have children engaged with the text at a deeper level as they become treasure hunters to find those words within their text, but will also present the class with a running list of go-to words for them to use in their writing and for them to use if they come to a word they do not know when they are reading. Expanding a child's vocabulary is an effective way to increase reading comprehension.

Lane Smith (2009) has written many children's book, one of them being *John, Paul, George, and Ben*. The humor in this story is sure to attract young readers, and the vocabulary will enrich a child's mental lexicon. The author introduces words like *lad, penmanship, belfry, hatchet,* and *poultry,* among others. These words all have pictures that correspond to the text so a reader has many context clues to figure out the meaning of the word. In the classroom, it would be easy for a teacher to begin

occasionally using the words penmanship instead of handwriting and lads instead of boys. Simple changes like this can profoundly increase a child's vocabulary, thus improving fluency and in turn comprehension.

Establish the Purpose of Reading

One simple, and yet effective, tool is prior to reading a text, to work with the students to establish the purpose of reading the selected text. The brain science community supports the idea that "memory is enhanced by creating associations between concepts" (Medina, 2008, p. 84). If the brain can make a connection between the pre-established purpose of reading and apply that to the reading itself, memory will in turn be enhanced, which thereby means comprehension of the material will increase.

A reader's purpose for reading a newspaper versus a fiction novel versus a manual is all very different. A reader does not read a manual with the intent of being entertained, likewise a reader would not pick up a novel and expect to learn how to operate a new appliance. In order to develop readers who can think and read critically, a teacher must explain this to students and provide the students with a variety of reading experiences so the students can discover the truth of this for themselves. Purposeful readers "read to find out how to use a computer, read a magazine for entertainment, read a classic novel for enjoyment, read a guidebook to gather information about a tourist spot, or read a text book needed for a course" (Sousa, 2005, p. 97). Readers need to be taught that the purpose of reading can vary.

A teacher may introduce this idea in the classroom by providing students with a variety of texts including magazines, textbooks, dictionaries, picture books,

etc. The students should be given time to explore these books and discuss why they selected that particular text and what they learned from it. The teacher can guide them into seeing that the reason they selected the text directed their reading with a specific purpose.

Once students understand this idea, teachers can introduce the purpose for a selected reading prior to actually reading the text. The students should be a part of this discussion and can offer up their purpose for reading. Knowing the type of text will help to guide the purpose. However, another useful tool to use in conjunction with this is a 3-column K-W-L chart. The *K* is used to access background knowledge as the students share what they already *know* about the topic. Their answers are added to the chart. The purpose for the reading is represented by the *W*. This is what students *want* to know, learn, and discover from the reading. This is also charted prior to the reading of the text. The *L* column is filled in during and after the reading as the students record what they have *learned* as a result of their reading. This tool helps children to develop a clear purpose for the reading, gives them a visual way to check their purpose as they are reading, and allows them to see a direct correlation between their purpose for reading and their new learning as a result of the reading. The visual piece ties into brain research, establishing a purpose helps to increase motivation, and accessing background knowledge is also a valuable component of brain research findings for increasing learning.

Gail Gibbons does a fabulous job of producing non-fiction literature that is appealing to children. The illustrations make the difficult concepts easier to understand while her choice of information makes for an interesting read. She has

the ability to make non-fiction literature appear attractive. Through her books, children can discover the fun that can be had with non-fiction texts. Gibbons' (2000) book *Bats* would be a great addition to a unit of study on bats. This book can also be used to help children establish a clear purpose for their reading. The teacher can use this as a teaching tool for guiding children to their purpose. For example, if during a discussion on bats a question arises pertaining to a bat's physical characteristics, the teacher can show how a table of contents can lead children directly to that information within the text. Therefore, they have established a clear purpose for their reading: learning more about the physical characteristics of a bat. That search will guide their perusal of the book, giving them a succinct purpose for reading those specific pages and studying those particular illustrations. This will all aid the overall comprehension of the text.

Self-Monitoring

A good reading teacher will provide students with many strategies and supports as they continue to grow as a reader. It is important that the teacher is there to help guide the child's learning. However, the child also needs to assume some responsibility for his or her comprehension and that is where the self-monitoring strategy, supported with scientific research from the National Institute for Literacy (Sousa, 2005, p. 98), comes into play. This approach puts the child in the driver's seat of his or her own learning. Employing this strategy helps the reader to become aware of when there is a lapse in his or her comprehension of the material, which may occur for a myriad of reasons including: insufficient background knowledge, too much focus on details rather than the main idea, maintaining

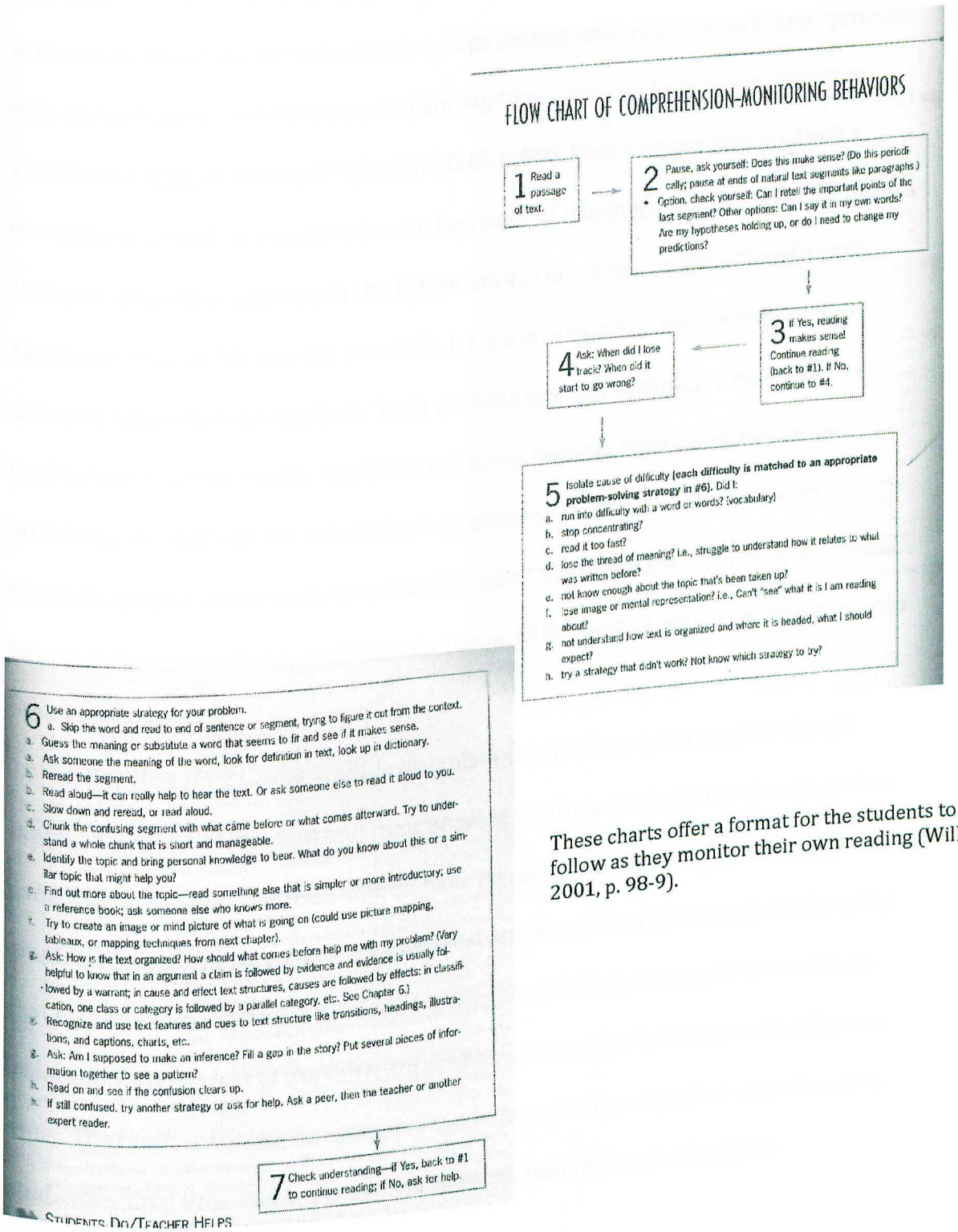
misconceptions, or a child simply *spacing out.* In addition, the child learns "appropriate strategies for resolving problems in comprehension" (Sousa, p. 99). The importance of comprehension to reading cannot be understated and "direct, explicit instruction that helps readers use specific strategies to make sense of the passage" has been shown to improve comprehension (Sousa, p. 97). This is one of those specific strategies for improved comprehension.

This is a form of metacognition, whereby children are encouraged to think about their own thinking. Students continually assess their own understanding as they move throughout the text. There are multiple forms of monitoring that children can use. Research from the National Institute for Literacy recommends the children: identify where the difficulty occurs, indentify what the difficulty is, restate the difficult passage in their own words, look back through the text, look ahead in the text for information that might help resolve the difficulty, and summarize the text in their own words (Sousa, 2005, p. 99). A teacher can work to introduce these strategies to students one at a time and work slowly through them to allow the child to begin to develop self-monitoring skills. This will allow the children to develop some reading independence and will help comprehension to improve as a focus on monitoring their comprehension is placed upon their reading. Readers know how to solve reading problems when they occur.

When Stephanie Harvey works with students, she explicitly teaches her children to employ these strategies: track their thinking through coding, writing, or discussion; notice when they lose focus, stop and go back to clarify thinking; reread to enhance understanding; read aloud to clarify meaning; identify and articulate

what's confusing or puzzling about the text; recognize that all of their questions have value; develop the disposition to question the text or author; think critically about the text and be willing to disagree with its information or logic; and to match the problem with the strategy that will best solve it (Harvey & Goudvis, 2000, p. 20). Demonstrating this for students and being direct in the teaching of these strategies empowers readers. It gives them ownership over their reading, thus increasing the engagement level. Brain research has proven that the higher the engagement the higher the learning. When students are attuned to their thinking processes, they can become aware of when comprehension is lacking. Once a student realizes there is a gap in comprehension, then learning can take place as the child uses fix-up strategies to correct the understanding.

Children should be encouraged and challenged to self-monitor each time they read. Most any book is useful for this strategy, as long as children are actively monitoring their comprehension of the material. Conferring with children, conducting running records, and listening to children describe what they have read, are all situations in which teachers can guide and prompt self-monitoring skills. Going back to the visual piece of brain research, for some children having a pattern and a visual reminder can be helpful when using this strategy. The following chart is a guide for teachers to support development. A more child-focused chart developed by the teacher, using specific language that will be familiar to the students in the class, will help guide children as they self-monitor and provides readers with some fix-up strategies on what they should do next as they continue to read or work to rebuild their comprehension of the text.



FLOW CHART OF COMPREHENSION-MONITORING BEHAVIORS

1 Read a passage of text.

2 Pause, ask yourself: Does this make sense? (Do this periodically; pause at ends of natural text segments like paragraphs.)
- Option, check yourself: Can I retell the important points of the last segment? Other options: Can I say it in my own words? Are my hypotheses holding up, or do I need to change my predictions?

3 If Yes, reading makes sense! Continue reading (back to #1). If No, continue to #4.

4 Ask: When did I lose track? When did it start to go wrong?

5 Isolate cause of difficulty **(each difficulty is matched to an appropriate problem-solving strategy in #6).** Did I:
a. run into difficulty with a word or words? (vocabulary)
b. stop concentrating?
c. read it too fast?
d. lose the thread of meaning? i.e., struggle to understand how it relates to what was written before?
e. not know enough about the topic that's been taken up?
f. lose image or mental representation? i.e., Can't "see" what it is I am reading about?
g. not understand how text is organized and where it is headed, what I should expect?
h. try a strategy that didn't work? Not know which strategy to try?

6 Use an appropriate strategy for your problem.
a. Skip the word and read to end of sentence or segment, trying to figure it out from the context.
a. Guess the meaning or substitute a word that seems to fit and see if it makes sense.
a. Ask someone the meaning of the word, look for definition in text, look up in dictionary.
b. Reread the segment.
b. Read aloud—it can really help to hear the text. Or ask someone else to read it aloud to you.
c. Slow down and reread, or read aloud.
d. Chunk the confusing segment with what came before or what comes afterward. Try to understand a whole chunk that is short and manageable.
e. Identify the topic and bring personal knowledge to bear. What do you know about this or a similar topic that might help you?
e. Find out more about the topic—read something else that is simpler or more introductory; use a reference book; ask someone else who knows more.
f. Try to create an image or mind picture of what is going on (could use picture mapping, tableaux, or mapping techniques from next chapter).
g. Ask: How is the text organized? How should what comes before help me with my problem? (Very helpful to know that in an argument a claim is followed by evidence and evidence is usually followed by a warrant; in cause and effect text structures, causes are followed by effects; in classification, one class or category is followed by a parallel category, etc. See Chapter 6.)
g. Recognize and use text features and cues to text structure like transitions, headings, illustrations, and captions, charts, etc.
g. Ask: Am I supposed to make an inference? Fill a gap in the story? Put several pieces of information together to see a pattern?
h. Read on and see if the confusion clears up.
h. If still confused, try another strategy or ask for help. Ask a peer, then the teacher or another expert reader.

7 Check understanding—if Yes, back to #1 to continue reading; if No, ask for help.

STUDENTS DO/TEACHER HELPS

These charts offer a format for the students to follow as they monitor their own reading (Wilhelm, 2001, p. 98-9).

Using Graphic Organizers

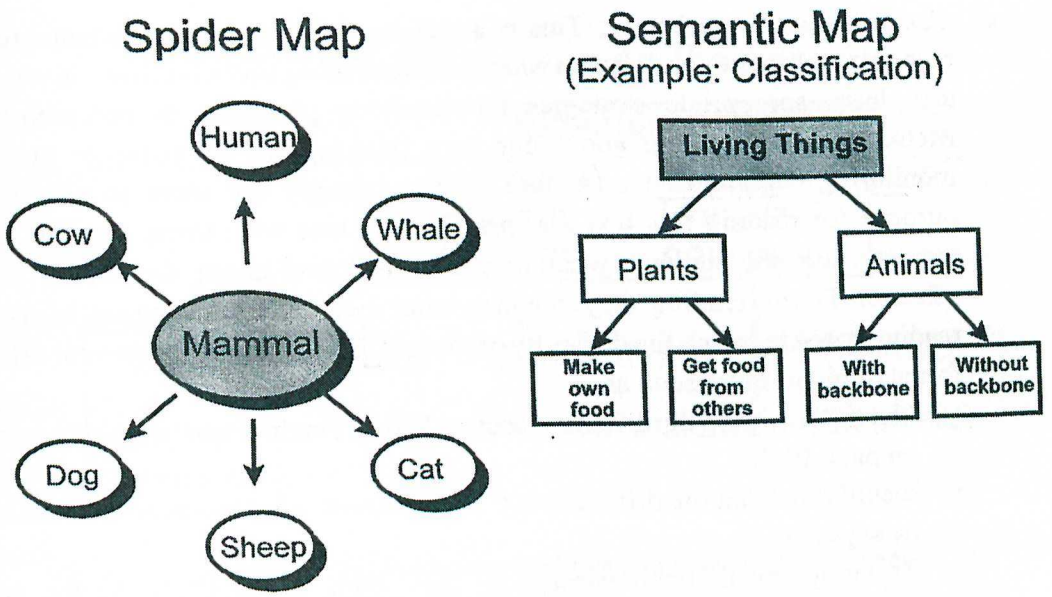
Graphic organizers provide a way for students to visually structure the information they are obtaining through their reading. They also provide a format for students to "illustrate the interrelationships among concepts in a text" and "provide cues about connections between and among ideas that can help students better understand difficult concepts" (Sousa, 2005, p. 99). These organizers are both a visual piece as well as a connection maker, both of which greatly increase the brain's ability to remember and retain the information. Due to the findings Sousa (2005) has found through his intense research, he is a strong advocate for graphic and semantic organizers saying that, "both of these types of organizers help students read to learn subject matter in all content areas because they capitalize on the brain's innate aptitude for remembering patterns" (p. 99). In terms of brain research, graphic organizers have much to offer. They provide structure, are visual, help to make connections, and take advantage of the brain's ability to recognize and remember patterns.

The first time a new graphic organizer is introduced, the teacher should explain how it helps readers and then provide multiple contexts for the use of that particular organizer. Students should have a good understanding of why that graphic or semantic organizer is being used and should become comfortable using that particular one before a new one is introduced. The brain needs to be able to separate the purposes of the different organizers in order for them to be effective tools. The teacher should do extensive modeling with the organizer and then give students ample time and support with the tool. Initially, texts should be

purposefully selected to go along with the organizer. This way, students can clearly understand which organizer to use when and how it can help them to organize their thoughts as they read. After the class has been introduced to this tool, many teachers choose to have these available to students for use whenever the student feels like they need it. This is allowing students to self-monitor as they figure out what tools they need in order to successfully understand the information that is being presented.

Different graphic organizers can be used for different texts and different purposes. When teaching about text-to-text connections, a Venn diagram can be a useful tool for children to use as it provides them with a structure for sorting out their thoughts about the similarities and differences between multiple texts. There are many variations on *The Three Little Pigs* tale, such as *The True Story of the Three Little Pigs* by Lane Smith and John Scieszka (1996), *The Three Little Wolves and the Big Bad Pig* by Eugene Trivizas and Oxenbury (1997), *The Three Little Javelinas* by Susan Lowell (1994), and a plethora of others. Using the format of a Venn diagram will help children see the connections between the different books, and it will also provide children with the context of when it is useful to use a Venn diagram. There are a variety of graphic organizers available, and teachers should model how to use many of them. Not all brains are wired the same (Medina, 2008, p. 59), so providing children with a variety of graphic organizers, may help each child find one that will enable them to be successful. Below are some of the other common organizers used in the elementary school classroom.

This chart depicts two types of graphic organizers students may use to help them make sense of their reading (Sousa, 2005, p. 100)




Mental Imagery

There is no argument that pictures can have a profound affect on memory. That visual information serves to greatly increase the brain's ability to remember the information that is read. Thereby, teaching readers to form their own mental images while they read can be a powerful comprehension method. Students should be encouraged to picture a character within the story, the setting, and even events that occur within the book. This method is effective and "readers...who form mental pictures, or images, during reading understand and remember what they read better than readers who do not visualize" (Sousa, 2005, p. 101). Teachers want readers who can understand and remember what they read, thus coaching students to form mental images is something to which teachers should devote time.

Because children are frequently exposed to so much technology, which is filled with ready-made images, many children are not used to having to come up with their own mental images. Instead, they are used to having images provided for them. Consequently, many children have not been exposed to creating mental images and have little practice in this area. This in turn means that they need to be given explicit instructions on how this can be done (Sousa, p. 101). When first initiating the use of this strategy in the classroom, teachers should begin at a basic level. Teachers may pull out nonfiction books filled with charts, diagrams, photographs, and maps and have students explain how those features of the text enabled them to comprehend the text at a deeper level. This may help students understand the importance behind creating mental images. Explain to the students that creating these images is similar to painting a picture in one's head or creating a movie within one's mind. This explanation describes the concept in terms that students can readily access.

When teachers are first introducing this, it may be important to have students actually draw their mental images. In speaking of the strategy of visualizing, Jeffrey Wilhelm (2001), PhD, has seen through first hand experiences that, "when students are helped to visualize and participate in textual worlds in new ways, engagement is intensified and comprehension is improved" (p. 115). As has already been described, when the level of engagement increases and when emotions are involved, learning will be magnified. The teacher may read a passage and encourage children to draw their visual and sensory engagement with the text. Remind students that this is a strategy that should be used to make them better

readers. Thus, this visualizing should not be viewed as an art project but as a way to 'see' and establish the meaning-making.

Students may differ on how they choose to draw their engagement with the text and this should be encouraged. Some students may choose to draw iconic pictures which carry more of a surface level interpretation of the reading. Some students may draw indexical pictures which are "images that represent a part of something bigger or suggest something related" (Wilhelm, 2001, p. 116). An example of this may be students drawing a flag to "signify patriotic celebration" (Wilhelm, p. 116). Still other students may draw pictures that are more symbolic and get at the deeper meaning of the text. Regardless of the way students choose to draw their engagement, each child is 'seeing' and sharing in the story. Some of the drawings, especially the symbolic ones, help children to show how they interacted with the text and what it meant to them on a personal level. This technique enhances memory by creating mental images, enables students to place themselves in the story which strengthens their relationship to the text, and stimulates imaginative thinking (Harvey & Goudvis, 2000, p. 23).

This strategy in and of itself is very beneficial for students. However, Wilhelm beautifully explains another purpose behind this method. Wilhelm (2001) writes: "

> Visualizing *[sic]* invites us to calm our reading and responding pace enough that we can notice a book's crucial details and conventions and make meaning of them. It's like that old advice, "stop and smell the flowers." Eventually, readers internalize the ability to do this without slowing down to

> write down their comments, glance at a list, or draw what they are visualizing (p. 119).

The goal then is that students eventually will be able to interact with the text without needing to stop and draw their visualizations. However, having students draw their mental images is a stepping stone on the path to having them internalize this strategy and forces them to pause in their reading to recap what has been read. Miller (2002) writes:

> When readers create mental images, they engage with text in ways that make it personal and memorable to them alone. Anchored in prior knowledge, images come from the emotions and all fives senses, enhancing understanding and immersing the reader in rich detail (p. 77)

This is the power of creating mental images; readers use their background knowledge and multiple senses, which Medina has stated as being key in making the learning permanent. Using short, vivid poems are a great way to introduce children to this concept. The book *Creatures of the Earth, Sea, and Sky* by Georgia Heard (1997) contains many short and extremely descriptive poems about animals. Begin by having children close their eyes as one of the poems is read aloud, ask them questions to prompt them to create deeper and richer mental images. The children may choose to act out their images, draw their images, and talk about their images with others. This exercise will help children to see how creating mental images can increase their comprehension of the text.

Debbie Miller has taught for over 30 years and has had many first hand experiences of teaching children to read. She works with her primary grade

students to lead them to create vivid mental images to enhance their understanding of the text. As Miller's (2002) students worked on this, one of her students explained mental images in this way:

> I'm thinking mental images are sort of like connections, only a lot bigger. Say a connection is like a kernel of corn. But when you put it in the microwave and it pops up big and hot, now *that's* a mental image. You hear it and see it and smell it and taste it and love it (p. 79).

She understands the power of creating mental images and involving multiple senses!

Questioning

Good readers ask questions as they read. This allows them to interpret the text, engage with it at a deeper level, and make connections. Many critical readers do this without even being fully aware that they are engaging in this. It has become internalized and a natural aspect of their reading. Beginning readers however, often struggle with this concept. The curious reader is the engaged reader and curiosity spawns questions. Therefore, readers need to learn the importance of and mechanics of answering and formulating questions as they read.

Stephanie Harvey is a proponent of teaching students to question as they read. Through her extensive work with young children, Stephanie has learned that "questions are the master key to understanding. Questions clarify confusion. Questions stimulate research efforts. Questions propel us forward and take us deep into reading" (Harvey & Goudvis, 2000, p. 81). Teachers want readers who interact

with their reading on a deep level, so teachers need to embrace the questioning strategy.

Through his research, Sousa (2005) has found that "studies show that teachers' questions strongly support and advance how much students learn from reading" (p. 100). This implies that even if students are not yet formulating their own questions as they read, having questions given to them can also be impactful. These questions provide the students with a purpose for reading, help to focus attention on what is being learned, increase interaction with the text, encourage self-monitoring, and help students to formulate connections between what they know and what they are reading (Sousa, p. 100). These questions can be asked of students before, during, and after reading. Surface level questions will generate surface level answers and can be a way to quickly assess whether the student has a general understanding of the text. However, deeper level questions will create a more personal involvement with the text and will prompt deeper thinking.

Teachers need to model for students how readers formulate their own questions as they engage with a text. This is best done when a teacher reads a book and thinks aloud about the questions she encounters as she reads the passage. The teacher may even write these questions down on chart paper. This way, the teacher can also chart the answers that are discovered as she reads further. This allows the children to have a window into what types of things critical readers are questioning as they engage with a text. Students can then see how some questions are clearly answered within the text, some answers can be inferred, some questions can be answered through background knowledge, some answers can be sought through

further research, and some questions remain unanswered, which is fine. Often times, children are hesitant to ask questions as they read because they are afraid the answer will not be found. Having a teacher model in such a way enlightens the children to see that not every question that is asked receives an answer. Children are not always aware that they can be developing questions, therefore demonstrating this and encouraging children to formulate their own questions is a powerful tool for children. Another advantage is teachers can show children how one of the questions can spark an interest in research on that topic, which results in a much deeper level of engagement and lots more learning.

Encouraging children to question the text increases engagement within the text because they seek answers to questions in which they have an invested interest. Brain research supports the idea that increased engagement causes increased attention which in turn increases memory, learning, and comprehension. Students who are simply decoding the text cannot engage in questioning strategies.

Garland and Kuichi's (1997) *The Lotus Seed*, is a tale of a Vietnamese family that is forced to flee their beloved homeland. The family is only allowed to choose a few possessions prior to sailing to America; one of these possessions is the lotus seed. As this story is read, the teacher should encourage children to ask questions and keep track of the questions that are asked. The teacher can reread the story several times over the course of the next several days. The questions will help to establish a purpose for the reading while the rereading will be an effective way to demonstrate to children that rereading can help to clarify comprehension. As children discuss their questions that arise from this book, they will begin to

understand that some answers can be found within the text if the text is reread, some questions can be answered by making inferences, and some questions will need to be answered from an outside source or will remain unanswered. Many books will spark young readers to deeply engage with a text by asking questions about the reading.

Drawing Inferences

The writer Umberto Eco wrote, "Reading is the taking of inferential walks. The text offers point A and point E, and the reader must walk points B, C, and D to reach point E" (Wilhelm, 2001, p. 25). If a reader does not draw inferences as they interact with a text, then much of the meaning of the text is lost. If there is a major gap between what the author has directly said and what the reader has implied, then comprehension will suffer.

Harvey and Goudvis (2005) describe inferring as being at "the intersection of taking what is known, garnering clues from the text, and thinking ahead to make a judgment, discern a theme, or speculate about what is to come" (p.11). The process of making inferences requires that a reader be deeply engaged with the text. In order to infer, readers must be able to read between the lines which allows them to make their own discoveries without the author's explicit comment. Harvey and Goudvis explain that, "inferential thinking occurs when text clues merge with the reader's prior knowledge and questions to point toward a conclusion about an underlying theme or idea in the text" (p. 23). In order to be carried out effectively, this strategy involves a synthesis of other strategies.

In order to first introduce the concept of making inferences to students, teachers can bring in miscellaneous supplies and ask children to infer what their purpose is. Or, teachers can write letters from popular characters and have children infer who wrote the letter based upon information within the text. Teachers can even make a facial expression, an angry face for example, and have children infer what emotion the teacher is conveying. With each of these, discussions should occur afterwards to track the children's inferences and help them see what information they used to make the inferences. The way this is introduced is not as important as helping children to see that they make inferences on a daily basis. Although this concept may sound foreign to the learners, they should soon realize that this is something they are comfortable doing. Teachers must name what they students are doing and use this as a connection to the next step. Now, they simply need to learn how to transfer this strategy over to their reading. "Readers naturally bring their prior knowledge and experience to reading, but they comprehend better when they think about the connections they make between the text, their lives, and the larger world" (Harvey & Goudvis, 2000, p. 10), and teachers need to be the guide that helps children to see this and engage in this.

The comprehension gains children achieve when they infer are numerous. Through the process of inferring readers are able to use clues in the text to make conclusions, make predictions both before and during reading, recognize underlying themes, and use pictures to help gain meaning (Harvey & Goudvis, 2000, p. 24). Using picture clues is a great inferring strategy that even beginner readers can employ. An excellent way to demonstrate this for children is for teachers to make

their thought process available to the students by modeling the strategy by thinking aloud as they read a text. This allows the students to have a view inside the teacher's head so they can begin to grasp how a reader goes about inferring. A reader who can infer is a reader that has a good grasp on reading comprehension.

A teacher may begin a lesson on making inferences by reading this letter to the class.

Dear Fairy Godmother,

I am writing today to invite you to come visit me at the palace. It really is quite lovely here and all of my mice friends seem to be enjoying themselves. They like that there is no longer a cat around to chase them!

I am slowly making the castle feel more like home. The local carpenter recently built a display case to hold my lone glass slipper. That shoe is beautiful and very dear to me, however it is not very comfy and it doesn't stay on my foot very well.

The Prince and I are very happy here. I was so used to doing all the housework at my old house that sometimes I forget and start cleaning the castle. The maids are quick to tell me that a princess should never have to clean.

Everyone here is very nice and welcoming. I definitely know that I am loved here at the palace. I have only seen my step mother and step sisters once since I left home. They were not very friendly to me which made me appreciate my new home at the castle and all of the lovely people here so much more. I would love to see you soon!

Your friend,

?

After reading the letter, the teacher should have children make inferences pertaining to the author of the text. The teacher can help guide the children by asking questions such as: "Who is the author? What clues in the text did you use to make your inference?" This gives the teacher a window to the child's thinking and allows the teacher to assess whether the child understands how to make inferences. It also provides the teacher with the opportunity to model what clues allowed her to draw an inference as to the author of the letter.

"When readers infer, they use their prior knowledge and textual clues to draw conclusions and form unique interpretations of text" (Miller, 2002, p. 107). Judi Barrett's (2008) book *Never Take a Shark to the Dentist (and other things not to do)* and Laura Huliska-Beith's (2001) *The Book of Bad Ideas* are great, humorous picture books that would be useful for the teaching of inferring. The writing on the pages is kept to a minimum, allowing the reader to infer why the idea is bad based upon the illustrations. The answers are not found in the wording, requiring that the student use the pictures as resources. One of the pages in Judi Barrett's book implores the reader not to take a centipede shoe shopping. From the picture, the reader can infer that shoe shopping with a centipede is not a good idea due to the fact that centipedes have 100 feet and will therefore require lots of shoes. Asking probing questions of the reader, will allow the teacher to find a variety of resources that will allow for inferring.

## *Writing like a Reader*

What features can authors incorporate into children's literature that will activate the reader's background knowledge and aid in their overall comprehension? Because comprehension is such a critical component of reading and since brain research has revealed the impact attention has on overall learning, I sought out research based comprehension strategies and techniques that are effective for improving children's reading. This provided me with the opportunity to combine what I am learning about brain research and comprehension strategies and to then apply that knowledge to the writing of a piece of children's literature.

I was given an incredible opportunity by Professor Lupton of the College of Education, Professor Albert from the College of Pharmacy, and Professor Rao from the Art Program to join with eight other Butler students and jointly publish a piece of children's literature which illustrates aspects of what it means to be a retail pharmacist. My classes at Butler provided me with wonderful instruction on how to teach reading and how to use children's literature across the curriculum. Now, I had the task of creating a piece of children's literature and I wanted to use the information I have learned, and am learning, to make this a book that is useful for the instruction of reading.

A group of three elementary education students, three fine arts majors, and three pharmacy students, along with their respective professors, were the team behind this project. The pharmacy majors were largely responsible for the information that would be found in the book, the education majors were there to

ensure the book was accessible for children and had features that would make this a useful book for teaching, and the art majors created the illustrations for the book.

For the beginning of this project, the education majors spent time pouring over many children's books analyzing the content, features, targeted age group, and illustrations. At the same time, the pharmacy students were supplying input about the information that needed to be included within the book. The illustrators were also looking at different formats for the illustrations.

The large group was divided into three groups with one representative from each of the colleges. These small groups each developed a pitch and created a video to sell this pitch to the other groups. In order to make this process successful, collaboration among the contributors was key. Much of this work took place over the summer. Conference calls and emails became an extremely important method of communication. Through these conference calls and emails, a collective vote was taken and the group decided to create a rhyming poem about a young child's trip to the pharmacy. Sousa writes this pertaining to poems, "because they contain rhyme, rhythm, and meaning, poems are an easy and enjoyable way for children to practice reading" (Sousa, 2005, p. 86). It has been stated that practice is important for fluency and comprehension, so it was with that hope that the rhyme and rhythm found in this poem book would encourage readers to read this story again and again.

The targeted age group was kindergarten through second grade, so the education majors worked together to create a text with wording, phrasing, length, and theme that was appropriate for children at this age. The text went through

many drafts to make sure it was appealing to children and sounded just right. One of the mentor texts that was used was *Dark Emperor and Other Poems of the Night* by Joyce Sidman (2010). This book has one poem per page about animals. On the other side of the page is a factual box providing more information about that particular animal. Many of the words in this pharmacy book might be new to children, and the idea of having some of these words explained in their own box on the page, following the suit of the mentor text, is an idea we decided to incorporate. As the story progressed, the boxes did not fit, in regards to readability, with the illustrations, so it was decided to put a small glossary at the end of the book.

The team decided to have the characters in the story be humans. This book was supposed to be a teaching tool about the world of pharmacy, so it was decided that the characters should be humans. This was done with the hope that it would help with the transfer of knowledge as children would be able to make more connections between the book and their own lives and more easily see themselves within the story, because enabling children to make connections is key.

The background of each page is a black and white photograph of an actual pharmacy, doctor's office, storefront, etc. By using real pictures, the reader will be able to identify more clearly with the text. Sousa (2005) writes that, "Teachers should use concrete images when presenting an abstract concept" (p. 17). Some of the concepts in this book are abstract for young children, thus the idea of using concrete pictures of a pharmacy will make that transfer of knowledge, and thereby the comprehension of the story, easier for the reader.

Tapping into a reader's background knowledge allows for a story to be understood at a deeper level. The title of the book that was written is *Pharmacy & Me*. The title may not hook the reader because of its creativity, however it does enable the reader to immediately know what the book is about. Therefore, from page one the reader can already be accessing any knowledge pertaining to pharmacies that the reader might have. The most common pharmacies that exist are similar to a CVS or are within a grocery store. For the illustrations, the pictures were taken of these types of pharmacies. The reader sees the groceries and other items that are often available when one goes to a pharmacy. Using these familiar pictures helps the reader to once again tap into that background knowledge. "Schema theory reaffirms the importance of the role of prior knowledge in learning. Teachers of reading should consider using strategies that activate the reader's prior knowledge, thus enabling them to better understand the text" (Sousa, 2005, p. 53), this is something that not only reading teachers can do, but also something that children's authors can attempt to build into their books. The comprehension of this particular story is aided by the intentional use of photographs.

Comprehension "occurs when readers derive meaning as a result of intentionally interacting with the text" (Sousa, 2005, p. 96). So, ultimately comprehension is the role of the reader. But, as authors, the team of nine Butler students and three Butler professors, tried to build in some strategies that would make the comprehension of their book easier on young readers. Teachers cannot comprehend a text for a child; the child has to do that for him or herself. However, because comprehension is so crucial to successful reading, teachers need to be

equipped with knowledge of how to teach comprehension and strategies for teaching this important skill. Providing comprehension strategies to aid children as they struggle to comprehend is a role that teachers can and should play. Brain research is fueling effective strategies for teachers who aim to teach comprehension. The use of these findings will greatly benefit students and will equip teachers with valuable strategies, techniques, and ideas to help make the incredibly difficult task of reading a little less challenging and a lot more attainable.

## *Conclusion*

The ways in which the brain learns truly is fascinating. There are so many facets to the inner workings of the brain, and the expanding field of brain science is providing teachers with knowledge of how the brain works. This knowledge in turn gives teachers access to better teaching strategies that work with, and not against, the natural inclinations and learning styles of the brain. This is information that should impact how teachers teach.

Some of the most recent brain research has recently focused on trying to understand how the brain learns to read. Has this research completely solved the mystery of how the brain does learn to read? No, but it has touched the surface of this and has revealed valuable findings for teachers of reading. A teacher who puts best practices into action will take heed of these recent findings and adapt his or her teaching to fit with this new knowledge.

Brain research has found that the more attuned and attentive the brain is to a particular stimulus, the more engaged the brain is. Medina (2008) writes:

> A strong link between attention and learning has been shown in classroom research both a hundred years ago and as recently as last week. The story is consistent: whether you are an eager preschooler or a bored-out-of-your-mind undergrad, better attention always equals better learning. It improves retention of reading material, accuracy, and clarity in writing, math, science-every academic category that has ever been tested (p. 74).

Simply put, the more engaged a brain the greater the learning. This ties directly into reading and reading comprehension.

What exactly is reading? It is not simply decoding the text word by word. A large majority of the brain's work at this time is focused on simply matching the graphemes with a word already in the child's mental lexicon, which leaves little free space in the working memory for deeper comprehension of the text. However, even at this point, research shows that readers must be taught comprehension strategies. The more exposure children have to reading, the more fluent a reader they will become. And as evidenced by the quote above, a brain that is engaged will result in deeper meaning. The comprehension strategies have already been developed, thus teachers must find effective techniques to demonstrate the strategies. The comprehension strategies involve the thinking is going on in the head of the reader, and the techniques are tools to emphasize that thinking and make it come alive. This means that teachers must develop comprehension strategies that will engage readers, at all levels, in order to foster deep interaction and understanding of the text.

Explicitly teaching comprehension strategies greatly empowers readers who are: actively engaged in the text, asking questions as they read, making inferences about what will happen next, picturing themselves in the text and making connections to their own lives, who enjoy reading. These strategies empower readers to truly be readers in the true sense of the word.

One key on the road to successful reading is practice, practice, practice. Readers must be engaged in their reading and repeated practice can create unengaged readers. Teachers of reading need to establish practice with a purpose. Establishing a purpose gives the reader an incentive to read and produces more engagement. Engaging practice with a purpose can be done by performing Readers' Theatre scripts, conducting shared reading, and ensuring that the teacher has at least one daily, meaningful read aloud. Children are wonderers by nature and reading teachers should support, not stifle that by encouraging children to read about topics in which they have an interest. Because children are invested in the practice the learning will be deep and permanent.

There are many strategies that good teachers of reading will use, and brain research supports many of these strategies. Readers need to be taught how to tap into their background knowledge of the topic at hand. Doing so will allow the reader to comprehend at a greater level and interact with the text early on in the reading. This enables the reader to have access to difficult material. Taking a picture walk, providing an emotional hook, and giving students the gist of what they will soon be reading enables the readers' brains to prepare themselves for what they are about to read. These are ways to set children up for success. Capitalizing on the brain's

incredible abilities to recognize and learn from patterns can greatly increase comprehension.

The variety of strategies and techniques that are supported by brain research are numerous and range from involving multiple senses, to explicitly teaching readers how to infer, to teaching reading across the curriculum. As the field of brain research continues to expand, the knowledge base of how the brain learns to read will expand with it. The more teachers know about how the brain learns to read, the more likely these teachers are to choose instructional strategies that will result in successful learning. Teachers of reading have the amazing and challenging task of helping young children learn the intricate, complex, and ever-rewarding task of reading. By embracing comprehension strategies backed by solid, brain research findings, teachers are empowering young individuals to master the art of reading and finding the joy that can be found by immersing oneself in literature.

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